

# DRAGON USER

International edition

*The independent Dragon magazine*

60p US\$2.60 December 1983

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guide to  
machine code  
programming

Turn your  
Dragon into a  
word  
processor

The Dragon's  
software

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# DRAGON USER



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How to submit articles

The quality of the material we can publish in  
Dragon data stills itself will be a very great  
extent, inspired on the quality of the  
contribution that you can make with your  
Dragon. The Dragon 64 computer was launched  
as the market with a powerful version of  
Basic, but with very poor documentation.

There are two ways to use a Dragon editor  
and to become more useful and more useful  
every day. To help this, Dragon users can  
go with the rest of the development staff  
or at least someone that will make the  
necessary link — that means writing it down  
and passing it on to others.

Articles which are submitted to Dragon  
User for publication should not be more than  
2000 words long. All submissions should be  
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double space between each line. Programs  
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printed on plain white paper and be accom-  
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## Editorial

DRAGON DATA MAY BE carrying costs to Newcastle with the American launch of the  
64, but the trip should result in (a) lot of good news for UK users.

The similarities often often pointed between the Dragon and Tandy's Colour  
Computer (or Color if you prefer the spelling which reveals the machine's country of  
origin). What these similarities come down to is that both machines are based on Motorola's  
6800 chip and use Microsoft's Basic. In terms of appearance, there is no resemblance.  
The Dragon has a different shape, a better keyboard and two extra ports (for a monitor  
and the power pack — the Tandy machine has an internal power supply so the Dragon  
runs cooler). Inside the box the differences are even more marked — the Dragon features  
a truly international collection of chips. So the trip to the US is being made with a different  
bag of tools, but the timing turns attention to what's really in the bag of memory. Tandy  
has released its 64K Colour Computer just as the Dragon 64 arrives in the UK  
although here again there are differences — for instance an 80000 port on the Dragon  
64 is missing on its Tandy host.

But it is the Dragon's software that will be particularly well-treated. Many of the  
programs sold by Dragon Data's (and by market leader Microsoft's) came from the US at  
the first place — and now they go going back to work the American market. Shortly after  
all this cost-cutting for good news for users? It is when as Dragon Data would  
normally prefer it to be written. The Dragon 64 releases in the UK more software will be  
written for the machine. And the fact is a better value should persuade American  
programmers to write for the 64 in 20K mode. Tandy's Dragon Data's US partner is  
already considering American programs for release and persuading independent  
software houses to convert programs or write new ones.

And because Tandy is a larger and more established company, Tandy is keen to give  
staff a strong — and it's likely — identity. It has decided to assist user groups and give as  
much after-sales support as possible. Dragon Data's new managing director, Brian  
Mole, has already said that a more open-door policy is on its way on this side of the  
Atlantic — the UK may follow the US a lot. Closer to Newcastle maybe, but the return  
trip certainly looks promising for the UK.



# Letters

This is the place to air your views — send your tips, compliments and complaints to: Letters Page (Dragon User 12-12 Little Newport Street, London WC2R 1LD)

## Random Illusion

IN CASE you have any illusions about random function, try this: If the Dragon is switched on, switch it off first, then back on. Type in PRND and 2000 (enter) and note the answer which should be 100. Type it in again. This time the answer should be 64. Switch the Dragon off and on again and repeat the above. Surprised — you get 192 and 64. If you add it to the original answer for each thing is changing in a predictable way. It is to get the Dragon continuously switching random numbers but only printing an answer each time any key is pressed. The following routine does just that: 10 CLS  
15 PRND: HIT ANY KEY FOR A RANDOM NUMBER UP TO 200  
20 K = PRND 200  
30 AS = INT(215 \* AS) + THEN 20  
40 OLD PRND = AS TO 15

Alan Anway  
Amman  
Dumfrieshire

## Program changes

WITH REFERENCE to the programs published in the December edition of Dragon User may I suggest the following improvements:

**Squash** — In the program as written, on reaching of the 1000 or a score get points at 10000 at the end of each game. Thus, if the same player wins two games in succession, the second game ends with the score two already passed 10. This can be changed to be corrected.

501 5021 = 0 5025 = 0  
**Phoenix** — In the program the computer's hand is intended to that of the player and so providing the program suit for the computer's hand, the hand suit is located out. This can be over come as follows:

Define line 245  
Add line 245 = 5 5025  
2000

Modify line 500 L = 10  
It is possible that the computer could deal out two Aces. As written, the program then gives the computer's hand as the two Aces when it has actually lost.

Thus an additional test is required  
415 IF CT > 21 THEN CLS  
PRND = 100 5005  
= 1 5010 FOR A = 1  
TO 2000 NEXT A: YH =  
YH + 1 5025 500 50  
TO 500

I also found in this program that the built-in delay was not long enough and therefore, in changing to FOR A = 1 TO 2000. Also an additional delay was required.  
275 FOR A = 1 TO 2000  
NEXT A 2 A Not  
Clear

## 65495.0 success

AFTER READING that Oregon users have been saving programs while the machine is running in its double speed mode (PORG 65495.0) I decided to try and find a way of recording a program saved at this speed. The good news is that I succeeded in doing so.

The dual speed mode only addresses the machine's RAM and input/output in the faster speed, however by using PORG 65495.0 at the machine's memory is addressed at the faster speed. When in this mode there is no screen as the computer prints text back the video chip.

To test a program saved in the double speed mode do the following:

**PORG 65495.0 CLEAR (ENTER)**  
The screen on your computer should show your name and you will have to watch your cassette recorder to check if the program has finished loading.

When the cassette stops type PORG 65495.0 (ENTER)

Your screen should return to normal with a few characters displayed at random. When you type LIST your program should

appear.

You may find that the program has been corrupted as the cassette interface was not designed to run at this speed, but in general you should be able to recover your program and save it in the normal way.

J. McGowan  
Tyn and Tyn

## Program error

IN ISSUE 18 of the article about I/O ports (Dragon User September 1989) there is an error in the sample program which might confuse any readers bold enough to try this program.

When the Pk is first switched on all registers are set to 0. Therefore address P+2 is data direction register 0 — not A as stated. Also, in order to set the port lines to set as inputs the data direction register must be set to 0 not 1.

Although the program works as expected, line 33 FOR P+2: 355 is in fact addressing 00000 and setting port 0 to output. Because at bit 0 it is output bit 0, port A is automatically set to input.

D. Graham  
Dyffryn

## Manual criticism

A SHORT time ago I came across a magazine using which I felt I would like to convert to run on my Dragon. Unfortunately, upon rifling through it, I discovered that it contained a three-dimensional wire drawing when I had bought my computer. I remembered that Dragon speak caused only for steps to two dimensions.

Nevertheless, I demonstrated

anyway. Imagine my frustration when the Dragon accepted it. Lo and behold — I discovered yet another bug in the non-numeric manual.

I therefore would suggest to Dragon Users that they seek the people who wrote it and commission a new manual. It is only a very problem because the manual is selling the Dragon short and after all, it is supposed to help people get the best from their new computer.

To start — not machine alone about the new version.

Garrison Black  
Glasgow

## Memory locations

WELL (PORG) would make the memory of my Dragon 32. I have quite a few other things which I bought while I thought might be of use to some of your readers.

- 320 — Lower case shift
- 180-18 — Line number current (being recorded)
- 1207 — Print (in position in memory)
- 327 345 — Keyboard check
- 420 430 — Name of the being recorded for
- 424 447 — Name of the being loaded
- 220 — Play tape
- 225 — Play note duration
- 222 — Play pitch
- 340-345 — Words of phrase
- (0) 0 (2)
- 21 — Reserved memory

A. Brown  
County

## Stopping a listing

MY PEOPLE have complained about the fast screen listing. The listing can be stopped at any time by using Shift B, and to restart it by pressing any other key. By using Shift B and P a two-dimensional control is possible and should be very easy for games players who can't use joystick.

The meaning is multi state. If you can't then give signals for the ROM's memory in your programs — one advantage of the screen town state signals on the Dragon is that they show up well on a fast screen.

P. Phillips  
London W11

## Software Top 10

- |    |     |                        |          |
|----|-----|------------------------|----------|
| 1  | 170 | Three King             | Microcad |
| 2  | 175 | Armed Attack           | Microcad |
| 3  | 176 | Combined Game Workbook | Microcad |
| 4  | 177 | Program                | Microcad |
| 5  | 178 | Quadrant               | Microcad |
| 6  | 179 | Snake Treasure         | Microcad |
| 7  | 180 | Mixed Out              | Microcad |
| 8  | 181 | Score Attack           | Microcad |
| 9  | 182 | Grand Prix             | Microcad |
| 10 | 183 | King of Darkness       | Microcad |

Chart compiled by Bevis



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# Software firms getting adventurous with Dragon

THE PLAYERS of users looking for adventure are being answered — by Charles & Software, Richard Shepherd and Phoenix, among others.

Charles has transformed the celebrated *Mystic Isle* Adventures — 12 in all — to run on the Dragon.

The games, including the *Golden Bales*, *Time Machine* and *Escape from Prison 7*, will be released in January at £9.95 each. Charles's address is 25 Fawcett's Press Lane.

Richard Shepherd Software is starting off with two games, but more will follow if there are successful recordings of some signals.

First out are versions of *Spectre* (which is *Tron* splat) and *Tower and Paper Spy* at £8.50 each.

Richard Shepherd is

planned this conversion from the *Spectre* to the Dragon instead "cutting your teeth on real jobs".

The Dragon version is better and there's a better range of sound but there are problems with colour combinations. Running text on the screen had also proved difficult but ways had been found round this.

In *Super Spy* you have to locate the secret signal and then decide the nuclear response on the island. It was a successful year's research by a mission of *God Save the Queen*.

*Therapist's Tower* is a 3D real-time adventure. The tower has five levels each with 100 rooms — with the order of the rooms and location of objects changing each time you play.

There's also a certain amount of arcade action as you have a 'laser' gun to shoot baddies with.

Richard Shepherd Software can be reached at Elm House 23 25, Richmond Lane, Coptham, Weymouth Dorset.

Phoenix Software is also offering a combination of arcade and adventure titles — an *Islands* cassette.

Its first cassette, *Devil's Moon* of *Shiva* is the first in a series of titles, each at £9.95.

In the arcade part of the game you have to master 10 skill levels after which you design the running code for the adventure cassette.

Also at the end of each game level a clue to the adventure is hidden in the screen.

Phoenix Software's address is Springfield House 115 Marsh Road, Peter, Dorset.

## Centipede a foothold for Atari?

CENTIPEDE is the first game for the Dragon from Atari — but others will follow if it is a success.

Atari's software division has converted its arcade games to run on other home machines, including the two Commodore machines as well as the Dragon.

*Centipede* comes on cassette and costs £14.99. This may seem expensive for Dragon software but Atari argues that its games are second to none. Therefore the price is not too high in terms of what you get.

Atari is waiting to see how *Dragon Centipede* fares before deciding on follow-ups.

## Dungeon means business

DRAGON *Dungeon* is getting its grip on the business software market following last month's batch of adventures.

Its *Dungeon* Software offered last released *Cash Flow* and *Catalogue Sort & Mail* — both at £9.95.

*Cash Flow* is a menu-driven program which will manage money for either the format of a small business. Functions include account and new data transfers, setting up and setting of accounts, and output to printer.

*Catalogue Sort & Mail* is a menu-driven program listing system which sorts data by user-defined parameters.



## Stephen's 32 pays its way

SEVENTEEN YEAR old Stephen Harborne of Abbey Road, Harborne, knows how to make his Dragon pay its way. Here's just proved it by winning £1,000 in a national micro-electronics contest. Stephen has first place in the first national MicroQuest competition run by Williams and Glyn Harrie at Association of Trade and Industry's Mail Correspondence Applications Project.

Children aged between 10 and 21 had to design a new and practical use for the microelectronics in British industry. Stephen incorporated his Dragon 32 into a control system for operating a motor-cutter at 175, 1600 r.p.m. which makes glass pointers.

Stephen an apprentice at British Telecom International is *Mining Satellite Earth Station* has been interested in electronics since he was 11. He has had his Dragon — his third computer — for just over a year.

He plans to use the prize money to buy more computer equipment and is hoping that with the assistance of MAP



Stephen Harborne puts his Dragon 32 to work at his father's factory.

his idea can be developed commercially.

Another MicroQuest competition will be run next year, say Knight industrial has plenty of time to pick a head.

If you've got an idea and can't wait until then, why not try our competition at the back of the magazine? Your idea could win you a Dragon 64 from Dragon Data.



# NEW RELEASES FOR CHRISTMAS FOR THE DRAGON 32



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# The Dragon family grows

**1. FIRST UP** in our list of recent developments is a club that has been around almost as long as the Dragon itself. The Dordrecht Computer Club has been going since September 1982 and has escaped our notice until now probably only because it is a general computer club rather than just one for Dragon users. But it does have Dragon owners among its members and would certainly welcome more.

Members meet at the Maitland House of the Harbour House at the first and third Wednesdays of each month. The entry fee is club charges to cover the rent of the room is children 30p, adults £1.

For information on the club readers should contact A.R. Middleton at 14 Pines and Dove, Cherry Hill Estate, Dordrecht, Worcester WR6 1QR or ring on 0582 775 576 after 6 pm.

□ □ □

**2. SCOTLAND ALREADY** has one club for Dragon users: the Scottish Dragon Club in Edinburgh. But as Stewart Huxford of Glasgow points out, as position in the Scottish capital makes it a little awkward for him and his fellow Glaswegians, Stewart would like to hear from anyone else interested in forming a club in Glasgow. He can be contacted at 102A Parkbank, Lenzie, Edinburgh, Glasgow G78 5PX, or on Glasgow 850 5818.

□ □ □

**3. ANOTHER DRAGON** owner hoping to start a users' group in the area is Paul Kennedy at Ware Place, who has 16 years in already been incorporated. His address is 41 Broadmeads, Amersham, Bucks. Home Phone: Ware 82264.

□ □ □

**4. URWIDE J.R. Griffin** of Slough. Has a

*The British Dragon network grows! This month we discover and take a brief look at seven more clubs for Dragon users*

got a small group going already but is looking for more members. If you're in or near Slough and interested write to: 1 Gerrard Road, British Dragon Group, Slough, or phone Slough 35288.

**5. MEMBERS OF** the Sheffield Dragon Users' Club would certainly appear to be getting their money's worth. Although still fairly small (but growing, we are told) the club has secured a permanent discount for members at the largest software shop in the area and even provides a monthly newsletter which is saved free to every member. The boss? — Nothing, yet.

Monthly meetings are informal, alternating between a pub and the Sheffield City Polytechnic, and consist mainly of software swapping, keyboard testing, and discussion about the latest equipment.

Anyone interested in joining should contact Richard Crispden, 131 Hunningthorpe Valley Road, Rotherham. Richard's phone number is Rotherham 551 544.

□ □ □

**6. IN NOTTINGHAM** Dragon users have gained a little niche for themselves in the Nottingham Micro Computer Club. Its Dragon User Group meets Monday evenings at the Congressional Centre, Castle Gate, Nottingham. Guest speakers are often invited to the meetings.

Dragon owners interested in joining the group should get in touch with Mike Johnson, Rutland, 18 Cavendish Close, Bram-



cote Moor, Benson, Kidlington. His phone number is Nossington 233 541.

□ □ □

**7. FINALLY SOMETHING** for those with an interest in the G4. The G5/G User Group has been set up to provide the development of commercial packages. Equipment available to members will be limited on the new G4 and languages will include Basic 64, Pascal C, C++, C++, Assembler and Sage.

Meetings are scheduled for three times per week: Tuesday and Wednesday 7 pm-10 pm, Sunday Morning 10 am-1 pm. Subscribers will vary according to status of membership: from junior to commercial.

For further information contact G5/G User Group, 1st Floor, 16 New North Parade, Huddersfield, HD1 3JP. Tel: phone 0484 518179 (day) or 0484 584130 (after 5 pm).

**Derbyshire:** Dragon Users' Club, Dragon Dungen, PO Box 4, Ashbourne, Derbyshire — publishes Dragons' Trail.

**Devon:** Ian Chapperton, Baskin Dragon Owners' Club, 22 Beckwith Court, Baskin, Devon — meets every Saturday afternoon.

**Dorset:** Dragon 62 Users' Club, Games and Computers, 31 North Street, Wareham, Dorset — publishes newsletter.

**Essex:** Doug Bourne, Dragon Independent Owners' Association, School House, Newn Road, Rayleigh, Essex — publishes The Dragons' Tale.

**Lancashire:** Martin Farnham, North-

## Dragon clubnet

**West:** TRS 80 Users' Group, 48 Cavendish, Macclesfield, Cheshire, Lancs — growing number of Dragon users, meets monthly at library near Manchester and publishes newsletter.

**London:** 68 Micro Group, 41 Polden Road, Hurst, Middlesex — publishes 68 Microcom and meets on the fourth Tuesday throughout the year in the Regent's Park Library. Robert Smith, Ldn 071 NW1, all 6800 owners welcome.

**Staffordshire:** Tony Beckwith, Tame Computer Club, 57 Adams Close, Tam-

worth, Staffs — an all-user club including 18 Dragon owners, meets fortnightly.

**Wales:** Dragon Users' Club — publishes Drop Press, Dragon Data, Kerly Industrial Estate, Margam, Port Talbot, West Glamorgan.

**Wiltshire:** R. Gould, 88 Colmore Road, Swindon, 61 Minkins, Swindon, Wilt — interested in forming G4 G2.

**Scotland:** David Anderson, Scottish Dragon Club, 1 Walker Street, Edinburgh — regular newsletter.

**South Africa:** Ian McCall invites other SA Dragon owners to contact him at 38 Silverd Road, Randersbach, Cape Town.



# Price tags mark the good games

John Sariban weighs up the pros and cons of yet another month's attempt at software.

THIS MONTH'S COLLECTION is quite a mixed bunch. Microsoft continues its attempt to rule the world—or at least the part inhabited by Deegans—and has two fine titles. Oregon Data has released a wide variety of games and educational software, and there are some new business books, among the old favorites.

In *Shark Tycoon* (Dragon Group), the object is to avoid sharks from a small boat to collect gold bars from the sea bed. Each dive is controlled by the cursor keys and the response is fast. The problem lies in avoiding the sharks that swim across the screen in both directions. There are no flashy 3D graphics, costumes, but sleek blue monsters that snap at anything close to their heads. The display is of a very high standard and the game's gold bar to pity (though not sorry for the) shark.

I was rather surprised to see the price cut for this piece of software as being £12.95. I can see the marketing behind the high price-to-value ratio, but perhaps as they can be used to extend the usefulness of the computer, that most games have only a limited market. Maybe Programs for the Challenge tend to be more expensive than those for the Spectrum, but a price of around £10 is going to discourage many people from buying this type of material. I have paid the current

Double Day is another expensive Dragon Data program, but at least the fact that it is on cartridge is some small indication for a \$20 price tag — but even this is questionable.

A cartridge usually consists of a cheap little or small barrel based and fitted on an LCP-PROM. The manufacturing cost seems possibly to be more than 10¢, and per the pricing page is considerably 110-115 more than the equivalent 1¢ tape. Most people I know with a collection of games tapes have no more than one or two cartridges simply because 1 cartridge = 3 cartridges at price levels. I sometimes see reduce the cartridge price to give the marketing benefit. Games prices would undoubtedly increase sales.

## Value for memory?

What novelty and originality do you get for your last entered 2007 in the words of Paul Deneau, not a lot — certainly not 100 points. As you watch on the display board, you see the name Phoenix, and that is what the game turns out to be. Although the walls have several swing doors and there is a map in the attic, the fitting point is it is still a maze-based game like Cave Hunter and Ghost Attack. Sometimes

On Oregon Data may really suffer from Promnesia. If you don't yet have a sample of this old database, Oracle Bug can be recommended as having many got a few times that it still doesn't justify the high price.

Better value is achieved with Storm Arrows, which Dragon Data has priced at £7.99. The display consists of a grid instigated by border arrows. The object is to destroy all eight corner boxes they identify you by lining your shots up from.

As easier as it is, in an attempt to Legit Amplification by Stimulated Emission of Radiation then User must have some things to do with User — one difficult one.

**Under review**

Joseph Bala	David & Wang	179.00
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Morgan	Mark Townsend	179.00
Paul Weber	Steve Arment	179.00
S&B CPE	Robert Weiss	177.00
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a low frame and pixelated display. As the dictionary puts it: "The game itself is fast and exciting and the graphics, although not outstanding, are perfectly adequate for the type of game."

From the finest world of exotic passions to make flaming friendships, imagine the music — you have created in your life. It's the day of a lifetime you have to get it all in your hands. You stand back and admire your work when the neighbors' musical looking mirror in Beverly Hills from the Woodlands comes bouncing in, leaving a trail of footprints. You want to know the damage only to discover that you've run out of paint. Remembering the scene in the spring when you discover a moth that's crawled inside the box, you want to know the damage only to discover that you've run out of paint.

Stouffer (1989) has shown that

There are just a few of the things you have to contend with in Castle Fantasy from Microcad. There are eight levels of difficulty and a huge degree of freedom. The computer assumes that you want to run your Castle's business at a profit at the difficulty goes up, and your pots of cash just rapidly disappear from the table if the owner. Occasionally the display changes to point slowly clapping from the top, and the clock then it is to present a reaching the bottom. Bonus points are seen due according to how long you stay on your feet. That is an original idea and makes a pleasant change from the usual space games. To add to your enjoyment there is even a strategy of "Whistle While You Wait," at the back end!

## Cuthbert's welcome return

Last month I looked at Cutthroat Gulls Males with our unfortunate loss attempting to light up the Lunar Landing Pad. Mordred must be hoping that Cutthroat will become the Dragon equivalent of Honda whose repairs in the Spectrum are always calamitous. This month Cutthroat wants in two capacities: digging graves for the exhumed and pulling this back in the water.

Customers: When Digging is just like Monopoly. After 3 or 4 Moves you should, you control a giant figure who scuttles from level to level around the 3D screen digging holes in hopes of the cool Monocredits. On losing their way a hole too fast to let it quickly before they step out and introduce here. The game is instant, it is difficult as you progress and there is the added complexity of naming out of category as you race around. You can choose between control by keyboard or joystick and the game becomes fast and furious at the higher levels.

Although I performed pretty well in the jungle, my frequent air-ditching in the jungle. Using the point-and-click control is a tiny little red dot on the left and right and jumps over logs. When it reaches the side of the display, a fresh scene appears, with new hazards that must be avoided. These include poisonous plants and alligators. Occasionally Col Ward has some little Tootsie and some hanging vines. Further into the game, the encounters get out a little bit more, but I brought back before his final level, but I enjoyed that game a lot as it is necessary to build up skills in the early stages before you are competent enough to deal with the later hazards. Each time you die, you're resurrected, and you can't



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■ The trouble (or fun, depending on the algorithm). The graphics are superb and the response is very fast — certainly my favorite game of the month.

Towards the end of Star Wars, there is a combat sequence for several minutes, down the starboard canyon of the Death Star. This has inspired several games (programs) around the notion of intergalactic forces (Microdial). The wily and floor run by as you attempt to stay handy on to enemy space ships beneath you. Fighters spot your suit by following you with highly accurate laser beams. With special permission from Lucas, Newton, you are allowed to swoop greedily for a while as you drop bombs upwards but this is not an easy task. There are two-speed options, three-still options, and control is by means of a joystick. If you like arcade games, then you should find this fast and challenging, as well as keeping your finger finger warm on earlier evenings.

### The adventure trail

I have not spent any time identifying programs for some time. I think the editor is about to reach level to add a switch party out after the one month, but the month Microdial has released Keys of the Wizard. Although this is a full-on adventure, it is played in real time, so you have to be quick to enter your instructions. The display contains detailed room descriptions and real routes, while the top line gives you command status reports on your own condition and that of the eight creatures that inhabit the game.

The object is to explore many locations, fighting dangerous creatures and collect key treasures. At the beginning, you are asked the skill level from one to three, and the instruction sheet gives a large list of recognized commands. If the game continues for a long time, you can enter QUIT to leave the action while you do the washing-up at home for a while. If you wish, you can save the game status on cassette at that point, or you can type UNDO (U) to end the game. As with all programs of this nature, it is essential to have a map as you proceed. This is a well-constructed adventure, and it is a higher standard than the last amazing and Jerusalem adventures that Microdial released earlier this year.

Any more details will give too much



Scott Adams' *Just and Simple*

more, but if you like computers, dice and jewelry, and are skilled with acrobatics and mathematics, you will enjoy this game.

If you wish to lose very young minds into the dark world of adventures, then you may wish to consider Cirrus Adventure from Cirrus Data. Rather than being thrown in at the deep end, this is more of a gentle paddle in the shallows. The game is set in a typical ocean, and the object is to find the penguin island in the maximum number of moves. There are rather basic block graphics to show the tracks, the tiger's eye, etc., and each location has only two sets. The game is aimed at primary children, but only those up to five or so would play it a lot. If you press BREAK (not disabled) and tell the program you may wonder how Cirrus Data can justify the £7.95 price — only for more, and you could have *Keys of the Wizard*.

### Graphics disappointing

A similar message can be levelled at School House — if the format has to be kept simple as it is aimed at children, then the program should offer better graphics, and sound so that you feel you are getting something more substantial for your money. The object of the program is to find a missing computer tape hidden in a school. A map is shown at the start and a variety of maps during play. There are only two exits from each classroom, and map rooms are illustrated by some block graphics. In the kitchen, you can choose what you wish to eat, play games in the music room or draw pictures in the art room.

If children of six or seven can cope with Cirrus Adventure, then those at nine-ones should have little difficulty in playing School House. Although these two programs are easy introductions to keyboard

use in general and adventure games in particular, it would be more realistic pricing to put both programs on one cassette.

From programs that are designed for children to use, it is only a small step to educational programs. There are several of these this month, and they fall roughly into two groups. The first of these is that of formal computer-assisted learning. Take note from Microdial is a very welcome little set of programs, kindly packaged in a £8.95 folder. What you put it up, you can tell your master business right from the start. It should however be admitted that there are only ten sheets of brown paper inside the folder and two cassettes, in a flap in the cover. Don't get the impression that this is a slight case of over-packaging merely to justify the high price.

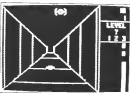
### Do-it-yourself education

The first two programs, Spelling Test and Word Drill, contain simple files for selection to demonstrate how they work, although in practice you would want to enter your own words. The day-to-day edition explains clearly how to do this. The cassette plays a word through the TV speaker and has to be selected carefully at the keyboard. After the test, the words are shown on the screen and can be copied on to a printer.

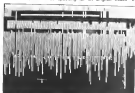
Word Drill is a multi-choice vocabulary test. Again the demonstration file shows you how to use the program. The screen first shows a word followed by eight selected definitions from which the correct is chosen. It may be entered before the program has had time to display the program is menu-driven and easy to use.

Maths Drill covers the four rules (addition, subtraction, multiplication and division) and has several features — up to six children can use it at once; there are ten levels of difficulty that adjust material only to the responses; there is a timer function and memory places are used as a reward.

Maths follows a similar course to Maths Drill except that it is designed to practice mental arithmetic. The complete package originates from Tom May at the States is for by Tom Gortley Knight and has rather obvious American educational lingo — the writing has got a sample although there is nothing there that would be speaking for an English school. ■



Interplanetary Forces: a good game for arcade addicts



Circus Pie 101: a pleasant change from space games



1. 100  
 2. 100  
 3. 100  
 4. 100  
 5. 100  
 6. 100  
 7. 100  
 8. 100  
 9. 100  
 10. 100

Dissemination: 1 (100%) Discovered: 1 (100%)





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ulate. This could encourage children who don't find maths an interesting subject.

4 limited it is, however, not exciting in presentation and a little restricting in the way in which you can enter answers — in long multiplication, for example. Children would not be even impressed with it, and it makes no attempt to explain why incorrect responses are not right. If a child already had the various concepts, then these programs would provide a way of reinforcing them, but the responses would tend to be constrained rather than ready with any understanding of the processes involved.

Maths Trek from Dungeon Software attempts to bridge the gap between a text program and a game. Based loosely on that well-known game which boldly goes into the digital is it also from a legend in a general, it don't know what Captain Kirk would have to say about that!). The screen depicts a journey between a view of the bridge of the Enterprise, complete with data and star screen, and a video display board showing map speed and distance to the next star base. The Enterprise is moved by

successfully answering maths problems in the four rules square numbers or areas. Various rewards, such as Klingon attacks and Black Holes, impede your progress and it takes several messages to complete your run through the series. Although lacking in the excitement of the usual Science games, it might encourage children who don't find maths an interesting subject. I feel that if this was used with children the difficulty level would have to be set rather low. I was asked for the square of 217, and that was only on level 25 out of the possible 50!

### Education leader

The most professional and carefully produced educational software this month comes from Dragon Data, although the programs were written by Applied Systems Knowledge Ltd, who sell their own software for other machines such as the BBC micro.

Number Puzzle allows you to choose between five different games — addition, subtraction, odds and evens, major numbers and self test. The first three games use the same format — four sets of numbers and choose between the given numbers between 1 and 99. Using numbers that appear at random at the bottom of the screen, the object is to fill the boards in at the same number as target. You can play against the Dragon or against a human partner, and the first first of these numbers filled in produces the winner.

In Magic Squares, the computer produces numbers for you to report in a

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► frame on the screen is from a source that is as magic as possible — in other words one that adds up to the quietest answer in each row and column as well as diagonally.

All A-Z's, programs use a symbol of a hand and begin to denote pushing the space bar and they are all very well and happy — only those keys actually needed for a response can be entered. At any time during the course of the program you can interrupt by pressing shift and an arrow key.

How and Graphics designed this language and developed it with themselves and other adults important in learning to read. There are several versions of the program available, but all consist of nine pages, mentioning pictures of objects and their associated names along the bottom of the screen. You either have to press the ENTER key when a cursor is over the correct box or enter the name of the picture itself accurately. The pictures are fairly unambiguous and the program clearly understands most of its stated aim is helping children acquire early reading skills.

### Maths arcade-style

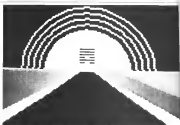
Member Gubler is the closest you could get to an arcade maths game. At the start you decide on whether you are going to use the keyboard or joystick and then enter the target number. The display changes to a board with a yellow line around which you enter your small guess. As it passes over various numbers, you can add them to your score as you attempt to reach the target number. The numbers are generated by  $+ - \times \div$  — say you could reach 100 by entering  $+2 +3 \times 4 +5 -1 \times 4$ . At the end you are issued to a higher level or demoted depending on how many guesses you have left. There is also the option for a self test. Children seem to enjoy the program greatly, and as there is a time limit it encourages fast mental activity.

These three packages all cost £10.00 each. I feel it rather expensive, but there is no doubt that they are above average and you may feel they would be worth having in an educational collection.

### Oriental flavour

Wings Records expanded through the 70s from a few retail outlets to producing its own records and now has 19 titles in several parts throughout the English language. Recently it moved into computer software with a range of titles for different machines. The first Dragon tape I have come across is *I Ching*. This is a rather elaborate choice for one of their early releases and may not be particularly accessible to many Dragon users.

According to early Chinese philosophers all things that happen in the universe affect all other things — a similar theme was present throughout the books on the last Page LP. This interdependence is like seeing the catnip as a large machine, where all the joints affect the whole and each other. It is like having a table store slightly out of adjustment in a car. This can cause the brakes to pull



*I Ching* if you're an electronic type, then you'll be an *analogue*

pulling a chain on the steering, the other breaks the engine and ultimately, the driver. The patterns and changes in the universe can be seen at all right, from the fall of comets to the selection of battles of plant stalks. Taoist philosophy would not attempt to change the future, merely to go with the flow, given the state of play at any particular time. These ideas were very popular with hippies in the late 60s.

The original and best way to think of a problem, such as 'how can I do this better and gain the public and to cost three cents or select a bunch of yellow flags from a pile. This was repeated six times to build up a hexagram of solid or broken lines. You will realise that there are 2 to the power of 6, or 64 different combinations that can result. The Chinese saw these as symbols of real things, such as thunder over water, or fire over a lake. King Wen made great contributions on each with his own. The *I Ching* is a book that contains these interpretations and it is supposed to offer an intuitive approach to solving the real question.

The *Virgin* program gives detailed instructions on the screen then tells you to think of a question while you press the space bar. A road leading into an enormous arch appears, and the hexagram is built up line at a time. As the final line appears, the screen shows a description of the hexagram and a brief commentary.

The program is well written, and the delays are clear. I feel however that the last of persons who would read the *I Ching* would be happier to use cards or sticks in a daisy-wheel room heavy with incense. A copy of the book in translation will cost you the same as the program and give you hours of interesting reading and insight into Taoism and its links with some schools of modern psychology. Just as I have never seen the point of complementary phone books — just as I wish to look it up in the paper version — the program seems to be made of a cleverer substance than a leaflet. However if you are an electronic type, it might be just what you're after.

To finish off the month, do you feel that

it is new job of software from Dragon Data is not only faster when you go to his. It might be designed to recognise two letter combinations that are not as familiar words and correct them on the screen into normal English. Hence the strange sentence above which would appear on the screen as: 'I know you will like to hear about a new piece of software from Dragon Data that might make a faster when you have to type letters. There is a dictionary already supplied on cassette, or you can enter your own, and there are a possible 26 x 26 of 676 combinations to use first words like on the old one.'

As well as this facility there are under word processing features such as subscript to word wrap, line move and delete, and things, direct, backspace/print option. The documentation is very full and comes in the form of a 48 page booklet. Although an interesting idea, I would have no personal about it. However, it is designed to save time in typing, and yet I would take some time before you let computer it using the abbreviated forms.

If you think it is worth the effort of learning to use, then it is definitely the sort of program to try out as it ships before you purchase.

### A sign of things to come?

In this collection of software there is only one true space arcade game. Whether the network is changing itself, I don't know. It certainly does it might all my shoulders knowing I no longer have to determine the earth from the animals at home. The usually descent on my head each month in some ways software themes, outside the course of *Science Fiction* moves from the 5th century. The philosophy of early flying robot like was, if it is an alien that is rather similar to the western, where it was a case of 'it is as an alien about it.'

Just as before in the movies began to have intelligence and sensitivity to the programs of the future will require you to have more than just a fast finger in order to be successful. ■





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THE DRAGON 32 has been a very successful machine, with over 190,000 produced in the first year, but in the micro business nothing stands still for long. So Dragon Data has supplemented its range with the Dragon 64. This includes all the features of the Dragon 32, with of course will be very familiar to readers of Dragon User: the main additions being 64K of RAM memory, a serial input/output (RS-232C) port, and a keyboard/mouse/plot routine. The machine is essentially the same as the Dragon model available for the past couple of months in the US through Tandy (in a co-operative venture with Dragon Data) except that it is built to UK power and TV standards.

## Familiar sights

At first sight the new Dragon 64 looks just like the well-established Dragon 32 as the same case and keyboard are used, although the case is grey instead of beige (to indicate the enormous memory upgrade!) and the number on the legs has changed. A closer inspection reveals an extra socket labelled S I/O has appeared on the left side of the machine next to the right joystick port and the old P I/O port has been renamed as PRINTER.

On power up the familiar start messages of the 32 appear, and if you PRINT before you will be surprised to find that the screen at BASIC1 — exactly the same as on the old 32. The reason for this is that Dragon Data has taken care to ensure that the new model is as compatible as possible with the old and when you first fire up the 64 you are running a machine which is configured as a Dragon 32.

This means that almost all existing software will run on the new model without modification. We believe that this was a very sensible move as it means that an extensive range of software is instantly available for the new version. All Dragon 32 Basic programs will function correctly as well as many machine code programs which are either self-contained or use complete ROM routines. Problems should only occur where the programmer has broken into a ROM routine in his module (which is pretty unlikely). Dragon Data says there will be no problems with any of their own software and a quick check of a range of independent offerings did not reveal any difficulties.

## Using extra memory

Of course, at this point you may feel that you have been cheated if you have just paid out good money for 64K of memory and nothing is happening!

To find the answer you simply enter BASIC as your first command after power-up when the pointer will blink for a couple of seconds and then the start message will reappear, but now with a blue flashing cursor to indicate a change of mode. Typing PRINT MEM again now reveals that 41941 bytes are available and if you now enter POKE 25-6 NOW to delete all the graphics pages and PRINT label again, less than 47386 bytes are. In your command for your Basic programming.

To underline how these two modes

# The 64: how it rates

Keith and Steven Bram  
Benchmark the Dragon 64

are implemented and more memory can be added to the Dragon, we need to consider a number of factors.

The first is that the RAM chip used in the Dragon can work in two modes known as map type 0 and map type 1. Map 0 will access 64K of RAM and map 1 64K of RAM. In map 0 RAM is accessed in the first 32K addresses and addresses 32768-65535 (ADDRESS-HIGH) and 49152-65535 (ADDRESS-LOW) are available for the Basic interpreter and cartridge port respectively. On the other hand in mode 1 only the 64K of RAM can be accessed (so you can have 64K of memory but nothing else!).

The standard Dragon 32 can only operate in map 0 but the Dragon 64 can be switched between these two modes. Of course, if you want to run Basic in 64K mode you still have to use 16K of memory to hold the interpreter, so only 48K (less some bytes reserved for system use) will actually be available for program and variable use.

It is possible to expand the memory of the Dragon 32 to 64K of RAM and unofficial upgrades are commercially available (in fact certain early models were apparently shipped with 64K RAM inside but not externally).

However, simply adding more RAM does not solve all your problems.

The problem is that the interpreter was written by Microsoft in past as dependent code so that it must occupy the same memory addresses as before. If you know that route you therefore now have 48K of

memory available but it is split into 32K below BASIC and 16K above it. This means that it is difficult to access the top portion for Basic programming, although it can be easily used for storing machine code. If you do not want to use BASIC at all then you can simply reprogram to 64K of RAM and use the full memory for machine code programs, alternative languages etc.

## Two ROMs

Now Dragon Data got round this difficulty by a trickery by looking into the 64 where you find the first three are two 16K ROMs sitting side by side at the back. In the newer machine these were 16K EPROMs but we understand that the final masked ROMs have now been produced.

One of these ROMs is essentially the same as that in the 32 and this is used in 32K mode. The second ROM contains a reassembly of the original source code for the interpreter at higher addresses (49152-65535 ADDRESS-HIGH) (the original cartridge port area).

If you are not familiar with the idea of position dependent code then think about the simple Basic program which will keep printing a message:

```
10 PRINT "HELLO"
20 GOTO 10
```

If you change the line numbers by adding 100 to each and sending the lines then the program will crash as there is no longer a line 10.

```
110 PRINT "HELLO"
120 GOTO 10
```

On the other hand if you had used REMUM 100 to on the original program the GOTO line number would also have been changed so the program would function correctly.

```
110 PRINT "HELLO"
120 GOTO 110
```

In effect the original BASIC program was position dependent: as GOTO 10 referred to an ABSOLUTE line number. Using REMUM had rather equivalent to test, simply as not only the position of the line, but also the address of the jump in GOTO was changed.

In the official 64K version of the Dragon the Basic interpreter therefore sits in the top of memory with a contiguous 48K, and later better it for programs and variables. Of course, using two ROMs must have increased the cost, but it is a far more elegant solution than trying to patch two expensive RAM areas together.

When you BASIC as your first command (or BASIC 48000 at any time) a new bootstrap routine in the 32K version ROM neatly swaps back and forth between map types 0 and 1 and copies the contents of the 64K version ROM into RAM using the 64000 buffer as a temporary store. Although the interpreter is in RAM it is non-volatile and pressing RESET will produce a warm-start so that you remain in RAM mode.

As the interpreter is located in RAM it is possible to modify it (although of course you must take care not to crash the system). You can easily change the Basic keywords so that the old ones are not recognised but only substituted via



The 64 is worth more consideration



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all to  
or to  
replaced  
replaced



4 note. For example, you could change ROM to NOW to prevent malfunctions before saving your program by simply pressing F4 (NOW) with the ASCII code for 0 (7B). Once you have done this then NOW will only produce a syntax error but NOW will perform a NOW!

This modification will be retained unless you press the RESET button when a checksum routine will discover that the original Basic has been corrupted and copy the official version back from ROM (this is a safety device to take your program goes haywire, and overwrote the Basic code.) When you switch from 32K to 64K mode, the system does not perform a NOW but rather a CLEAR and therefore any program located in the bottom 32K of RAM will be preserved.

## RS232C interface

The serial RS232C interface is a hardware implemented through a 5551 Asynchronous Communication Interface Adapter. This is a very efficient method of transfer as the CPU loads a full byte at a time and can perform other tasks whilst such data is transmitted.

Two new Basic commands have been added to download ASCII format tape programs (LOADAS) and machine code files (LOADBIN) from a host computer. These function like CLEAR and CLOADIN with parameters being optional. The basic rate can be specified at any of seven preset steps (110/300/600 with the basic rate load parameter or set with a PCORE command) any of 16 rates (30/180/360). The serial data is transmitted and received in one character eight data bits, two stop bits and no parity bit. The RS232C interface can be manipulated directly from Basic by PENDING and PENDING the appropriate system in the 5551 and a direct expansion of it now to input and output a character string.

Although the original parallel I/O port is retained as the default device used by the ROM-0-3 and LIST commands this port can be easily be changed and the RS232C interface used to load some programs in situ by FORCEASIOFF 1. Since both serial and parallel ports are now supported it is a mystery why Dragon Data's first release omitted the P-I/O port as PRINTER.

## Auto-repeat

A keyboard auto-repeat facility has been added in 64K mode and the delay is easily modified by PCOREing RAM to 0H11F. This feature has not been included in the 32K ROM to avoid complications with existing software, but details are given on how it can easily be added.

Our impression was that the keyboard scan was better with auto-repeat enabled so that rapidly pressing keys on the same row did not cause missed characters as sometimes happens in the 32.

The bug in the original 32 ROM which caused all GOTO calls to be treated as USING unless they were preceded by a zero, has been corrected in both modes. In addition the MCM and TRAPPRN functions have been altered so that they have their table read as an unsigned number and therefore do not return negative numbers for values over 32767.

## Documentation

First of all the 166 page book 'An Introduction to Basic programming using the Dragon by Richard Williams' which was originally produced for the 32 is included. We feel that this is probably about average for the standard of manuals produced by most home micro manufacturers, now that it has been thoroughly debugged although that is rather a back-handed compliment.

Secondly there is a very thin 8 page Dragon 64 Supplement which briefly explains the additional features, and gives the memory map in 64K mode. Regular readers will know that adequate documentation is one of our hobbyhorses but we regret that we feel that the information provided with the 64 is rather meagre and undoubtedly its limited page.

## You can't win them all

The main disadvantage of moving to 64K mode is that RAM now overlays the cartridge port area so that this cannot be accessed. This means that you cannot operate your disk system (Diagodes or Dents) or use cartridge utilities, at its mode. Of course you can load a program from disk in 32K mode and then switch to 64K mode to RUN it.

Although moving up to 64K mode is simple it is not so easy to switch back to 32K mode as no hardware booting is provided and all the Basic programs must be reloaded (but no doubt it will not be long before someone provides the answer to this one).

Cartridge operations are exactly the same in 64K mode as in 32K mode.

## Conclusions

Will you still need me — when I'm 64? Well, I apologise to Lennard and McCain now.

Dragon Data is following a policy of virtual development where each new product produces a more complete computer system. The Dragon 64 has been particularly designed as part of a system to appeal to the small business sector where a package containing the Dragon 64, Diagodes disk system and the OS-9 operating system is to be offered at a very competitive price around £500. A major reason for the arrival of the 64 at this 64K of memory are needed to run OS-9.

Of course, success will depend upon the availability of suitable business packages, but Dragon Data seems to have that side of things well in hand. Impressive firms, Matrix word processor and spreadsheet programs running under OS-9 were on display at the Dragon Data stand at the recent PC2000 show and we understand that these are to be offered at very competitive prices (around £300) in the belief that water sales are a better way to recoup the heavy costs of the hardware than a small volume of high priced sales. Only time will tell if this move into the business area will be successful but we feel that the machine itself should stand up to the hammering it is likely to get in commercial use.

Our own faithful 32 is now 15 months old and apart from all its other uses it has continued being used as a word processor

for something like a quarter of a million words without a moment of complaint.

To the home computer user having more memory tends to be a question of keeping up with the Joneses, or a case at some sort of vanity factor but you should really ask yourself how much more of it you really need to run decent programs?

We understand that Dragon Data will continue to manufacture the Dragon 32 and that the Dragon 64 is an addition and not a replacement. It costs some £60 more than the Dragon 32 and I you are a new user trying to decide between them then you must ask yourself how far you intend to ultimately expand your system. If your requirements are for a games machine with perhaps a little serious stuff thrown in then you are probably better off buying a 32 and spending your money on software.

On the other hand if you want to keep your options open and the extra cash will not break the bank then you are better off buying the 64 as the facilities allow access to a much wider range of computing possibilities.

If you already have a 32 and your horizons are expanding then the decision is more difficult as you must carefully consider the alternative methods of expansion.

If an RS232C port is your major interest then an add-on cartridge providing this facility for the 32 is available from Commodore Computers.

Matrix already offers 64K upgrades for the 32, the price of which varies with the particular add-on type used in your Dragon. When 64K chips were originally added to the Dragon 32 they were only sold by the chip manufacturer's at 33% of cost but had lost quality control limits. In practice it appears that many of these will actually work efficiently as 64K to the standards required here and some sample were tried with Hercules produce very cheap memory expansion.

Disadvantages of this approach are that you can only run Basic if you produce a tape copy and reload it into its original location and you may be plagued by mysterious crashes if add RAM chips are old.

## Dragon's alternatives

Dragon Data itself looked at two alternatives. The first is to provide an add-on board with another 52K of RAM. This would need to use tape-based Basic into the unofficial upgrade but it must first could be a copy of the new ROM which would be located at the top of memory.

The alternative under consideration is a complete main board swap to effectively produce a real 64. The disadvantage with this approach is that the only parts of the 32 utilising will be the keyboard, power supply and top half of the casing, so it will certainly not be cheap. A figure of £200 has been mentioned and if that is correct we feel that Dragon Data would be better off making some trade in and discount offer to Dragon 32 owners than getting bogged down in large numbers of labour intensive upgrades which can hardly be cost effective. ■



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**IT TAKES TIME** is long time, but you can write and edit word processor programs for the Dragon 50. Basic sure isn't enough to keep up with word typing, and though it uses up a lot of memory the Dragon still has enough left over for a decent sized text file. But Basic does feel badly when it comes to questions like moving chunks

of fixed around, that require a lot of PEEK, MODIFY PORE sequences. This article presents these machine code subroutines, which circumvent the main bottlenecks in assembly.

There is also likely to be a speed problem in basic programs, and so a subsequent article will present a Fortran-like code interpreter which offers a program the usual right-parenthesis-and-whitespace separation (even all mixed character forms) into some Gawk letters ( $\alpha, \beta, \gamma, \dots, z$ ) and all control lines and overlining (eg ASCII) (much as these facilities depend upon the printer playing the command sequences ESC  $\alpha$   $n$  for paper feed and ESC  $\beta$   $n$   $m$  for enter old main mode  $m$ , they may be regarded as dedicated to the Special MIXED mode and not for command control).

### Post routine

The program generates all possible OR and IF commands and assigns each character format commands. The HT (EBCDIC) double ending ESC: 8:1 (newline) etc will be encountered in the body of the text. The font reader also expects that there will be a line for header containing (approximately) of the left margin 11 after horizontal tab settings, null the right margin, the line spacing code and the line count (to and to below). In the author's program the header starts at 106607 and the last line runs upwards from 20000. They are always saved together on tape as if they made up a traditional code program — no attempt being made to use the file components of files.

The machine code routines use all inherently relocatable and may be loaded from Basic by a PEEK/SHOKE routine into any (relocated) part of memory (such as graphics page 1 1536-3071). If the initial addresses given to the routines are known to Basic as M0-M2, then their calling can also become (possibly) relocatable.

## Endnote

The first routine, called `MT`, carries out a census of `BLDLOC` where `WBLOCK` WPPC functions. Before being called it requires four parameters to be passed into it but as they are not destroyed the routine can be called again with only the changed parameters required.

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

[illegible]

**Program 599** *Can you find a number of 10,000,000,000 or 10,000,000,000,000?*





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• For a block move it needs to know the initial source address S, the initial destination address D, the number of bytes to be moved N (zero OK, but don't try negative), and a control byte M which controls the manner in which the moves are made. If bit 1 (in 2's) of the control byte is clear the destination address will increment as the move progresses. If it is set (M = 2) the destination address will decrement. Bit 2 has a similar effect on the source address and the effect of these two control bits is additive so that M = 3 will produce a block move with both the source and destination addresses working their way downwards. (The one decrement effect inherent in such machine code operations is hidden so that the moves appear to Basic to go with post-decrementing.)

• Bit 0 of the Mode byte is set so that M is any odd number: then a block move of N characters defined as N (0 to 255) returns N times to the addressing destination D.

## Nice effects

As well as carrying out all sorts of rapid rearrangements of the text file this subroutine may also be used to produce some nice effects on the TV text screen (addresses 1024-1035) — for example block moves of red (S = 16) may be used to indicate erased sections of text, and block moves with S and D differing by just 1 may be used to shuffle sections of text or messages left or right.

Note that S, D and N are 16-bit numbers requiring 16 or 32 byte pointers. In Basic you need something like:

```
10 X = 5: Y = M1 - 1: GOSUB20 X = D
Y = M1 + 5: GOSUB20 X = N: Y =
M1 + 55: GOSUB20: POKe M1: M1 =
M1: END M1
```

```
20 M = PEEK(255): POKe Y: POKe Y
+ 1: X = 255 + H: RETURN: POKe Y: X
```

## Second routine

The second machine code routine, M2, is used to FIND the whereabouts in memory of a sequence of bytes which have been defined as the contents of FS. The routine needs three parameters: the first and last addresses of the section of memory which is to be searched and a clue from Basic as to when it returns by FS. For example:

```
50 X = VALPTR (P) : Y = M2 + 1
GOSUB20: X = START ADDRESS: Y =
M2 + 14: GOSUB20: X = FINAL
ADDRESS: Y = M2 + 10: GOSUB20
ENDG: M2 ADDRESS: FOUND =
256 - PEEK (M2 + 14) + PEEK (M2 +
10)
```

If the search failed then the result obtained as ADDRESS FOUND will be one greater than the specified FINAL ADDRESS.

The routine assumes that the caller doesn't want to be told if the specified START ADDRESS doesn't correspond to an occurrence of FS: it therefore starts its searching procedures from one address higher up. This makes life easier during routine occurrence searches until the routine returns to answer through the same memory location as it used to specify starting address searches for.

Program 40			
0	40 0 0	F140	LDR A, PEEK ADDRESS M = Length of FS
1	0 0 0	LDR	244
2	0 0 0 10	RLA	00,00
3	0 0 0 0	AND	0000
4	0 0 0 0 0	LDI	0000
5	0 0 0 0 0 0	LDI	0000
6	0 0 0 0 0 0	LDI	0000
7	0 0 0 0 0 0	LDI	0000
8	0 0 0 0 0 0	LDI	0000
9	0 0 0 0 0 0	LDI	0000
10	0 0 0 0 0 0	LDI	0000
11	0 0 0 0 0 0	LDI	0000
12	0 0 0 0 0 0	LDI	0000
13	0 0 0 0 0 0	LDI	0000
14	0 0 0 0 0 0	LDI	0000
15	0 0 0 0 0 0	LDI	0000
16	0 0 0 0 0 0	LDI	0000
17	0 0 0 0 0 0	LDI	0000
18	0 0 0 0 0 0	LDI	0000
19	0 0 0 0 0 0	LDI	0000
20	0 0 0 0 0 0	LDI	0000
21	0 0 0 0 0 0	LDI	0000
22	0 0 0 0 0 0	LDI	0000
23	0 0 0 0 0 0	LDI	0000
24	0 0 0 0 0 0	LDI	0000
25	0 0 0 0 0 0	LDI	0000
26	0 0 0 0 0 0	LDI	0000
27	0 0 0 0 0 0	LDI	0000
28	0 0 0 0 0 0	LDI	0000
29	0 0 0 0 0 0	LDI	0000
30	0 0 0 0 0 0	LDI	0000
31	0 0 0 0 0 0	LDI	0000
32	0 0 0 0 0 0	LDI	0000
33	0 0 0 0 0 0	LDI	0000
34	0 0 0 0 0 0	LDI	0000
35	0 0 0 0 0 0	LDI	0000
36	0 0 0 0 0 0	LDI	0000
37	0 0 0 0 0 0	LDI	0000
38	0 0 0 0 0 0	LDI	0000
39	0 0 0 0 0 0	LDI	0000
40	0 0 0 0 0 0	LDI	0000
41	0 0 0 0 0 0	LDI	0000
42	0 0 0 0 0 0	LDI	0000
43	0 0 0 0 0 0	LDI	0000
44	0 0 0 0 0 0	LDI	0000
45	0 0 0 0 0 0	LDI	0000
46	0 0 0 0 0 0	LDI	0000
47	0 0 0 0 0 0	LDI	0000
48	0 0 0 0 0 0	LDI	0000
49	0 0 0 0 0 0	LDI	0000

Program 40: used to FIND the whereabouts in memory of a sequence of bytes

Program 41			
0	40 0 0	F140	LDR A, PEEK ADDRESS M = Length of FS
1	0 0 0	LDR	244
2	0 0 0 0	RLA	00,00
3	0 0 0 0	AND	0000
4	0 0 0 0	LDI	0000
5	0 0 0 0	LDI	0000
6	0 0 0 0	LDI	0000
7	0 0 0 0	LDI	0000
8	0 0 0 0	LDI	0000
9	0 0 0 0	LDI	0000
10	0 0 0 0	LDI	0000
11	0 0 0 0	LDI	0000
12	0 0 0 0	LDI	0000
13	0 0 0 0	LDI	0000
14	0 0 0 0	LDI	0000
15	0 0 0 0	LDI	0000
16	0 0 0 0	LDI	0000
17	0 0 0 0	LDI	0000
18	0 0 0 0	LDI	0000
19	0 0 0 0	LDI	0000
20	0 0 0 0	LDI	0000
21	0 0 0 0	LDI	0000
22	0 0 0 0	LDI	0000
23	0 0 0 0	LDI	0000
24	0 0 0 0	LDI	0000
25	0 0 0 0	LDI	0000
26	0 0 0 0	LDI	0000
27	0 0 0 0	LDI	0000
28	0 0 0 0	LDI	0000
29	0 0 0 0	LDI	0000
30	0 0 0 0	LDI	0000
31	0 0 0 0	LDI	0000
32	0 0 0 0	LDI	0000
33	0 0 0 0	LDI	0000
34	0 0 0 0	LDI	0000
35	0 0 0 0	LDI	0000
36	0 0 0 0	LDI	0000
37	0 0 0 0	LDI	0000
38	0 0 0 0	LDI	0000
39	0 0 0 0	LDI	0000
40	0 0 0 0	LDI	0000
41	0 0 0 0	LDI	0000
42	0 0 0 0	LDI	0000
43	0 0 0 0	LDI	0000
44	0 0 0 0	LDI	0000
45	0 0 0 0	LDI	0000
46	0 0 0 0	LDI	0000
47	0 0 0 0	LDI	0000
48	0 0 0 0	LDI	0000
49	0 0 0 0	LDI	0000

Program 41: jumps 400 bytes from a text file on to the TV screen







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# New man in the driver's seat

ONE DAY YOU'RE browsing through the news stands looking at microcomputer magazines including Dragon User, not knowing you know your managing director of Dragon Data. It couldn't happen to you or me — but it did happen to Brian Moore who has moved from electronics giant GEC to take over the running of Dragon Data.

Brian is keen to point out that his appointment does not mean any changes of direction at Dragon Data. The company is still keen both to move upwards in the micro market and to consolidate its position as a leading home computer manufacturer. This means that a Dragon 128 (a winning title) is under development, along with a new family computer to maintain the company's status on the market in which it began.

## Upgrade service

Brian is particularly impressed by the efficient many users have for their Dragons. He intends to repay this affection by being far more active in terms of our relationship with Dragon users. As part of this he recognises the need to provide an upgrade service for 32 owners and plans to offer various packages enabling this at the beginning of next year, if not earlier.

He also thinks that there is a "massive sales future for the 32, particularly owners. As well as keeping the installed base satisfied (providing plans for lots of new software) he intends to expand that base by launching new machines, beginning with the 64 which he describes as "a powerful home computer and ideal small business machine".

The arrival of OS-9 operating system on the 64 is regarded as particularly important. It will make the 64 a very powerful machine indeed, comments Brian. The 64 will thus be capable of handling issues ranging from issues such as word processing to advanced applications such as electronic mail — with more than one task being handled at once. Multi-tasking is the major advantage OS-9 has over Plus, the other main operating system for 68000 based machines. Its major disadvantage is that more applications software is available for Plus. However, Dragon Data argues that though this is the case at the moment, OS-9 software will catch up with Plus.

This move into business machines involves a marketing change for the company as it will be appealing to a different range of users. (Business buyers are more likely to approach dealers than the large chain stores such as Hays which is responsible for the bulk of 32 sales. So

Graham Cunningham talks to Dragon's new managing director, Brian Moore



one of Brian's other priorities will be to maintain very good relationships with dealers.

Brian is particularly pleased that the 64 is software compatible with the 32. As he puts it: "We like to support our staff's — and the dealer's — priorities relating to both machines and their software. Similar software in Doms 85 which arrives with the OS-9 system is planned to be compatible with the 128.

## Exciting future

Further beyond the 64 Brian prefers not to commit himself at the moment — but talk of machines which Dragon Data will cause use for administration and as central or personal menu systems such as Apple's Lisa include the excitement with which he views the future.

Brian's reluctance to discuss the 128 in detail is based partly on the argument that the more he says about it, the more competitors will know. Doubtless another reason is that talk of future projects draws attention away from the already available Dragon — although any wise micro buyer is likely to go for an already established machine which has overcome any initial bugs and has had a good base of software developed for it.

On the subject of the micro industry as a whole and Dragon Data's position in it

Brian is forthcoming. He thinks that "the company is a real nice business and enjoys staying on a day-to-day basis with up-to-date technology. He finds the industry itself exciting too — the challenge of beating the competition which as I try to do the same to you. Staying at least one jump ahead is the name of the game, although as Brian points out, deciding what exactly you have to stay ahead of can be a difficult job doing it.

The competition may be "a moving target, but you have also to distinguish between actual and perceived needs". As he says: "Too often it is only in the small print in advertisements that you find out when something is actually going to be available. Dragon Data's desire to be in publicly with advertising and to have room to improve on that developments are other reasons for Brian's reluctance on new products.

The question of when a new product will be available in quantity is of crucial importance to a company such as Dragon Data. For example, Brian admits that the 64 will not be a strong rival to the Dragon 32 — how strong depends on the number of Electronic Aztec can get to the market. Similarly, if demand exceeds the supply of Commodore's 64 then the Dragon 64 should suffer.







As their goals put both Benier and Dec have declared their intentions of moving apart — so the competition will be equally fierce for the 136. All this while companies such as Commodore and the giant IBM have made a business of moving down to last year's PC Junior (code named Peak) via a major rival — when it is available. These options if the IBM is likely to delay launching this machine in the UK until demand for its PC has quietened down. He adds, "IBM is very good at marketing, so I'm sure they'll pick the right moment." When they do pick their moment there is no doubt that the PC Junior will sell, regardless of its technical merit. At a time when the list of buyers in the micro industry is growing ever longer the appeal of IBM's security will be even stronger. Thatist already includes Grundy, Apple, Atari, Texas Instruments and Matsushita — and others (observers attempted to add Dragon Data under this year).

In December a £2.5 m new investment package was announced for the company. At the time it was estimated that customer sales had fallen short of production, pulling shares on Dragon Data a considerable high and borrowing facilities, according to a shareholders' statement at the time. The link between a bad summer and the need for more money (usually) results in the £2.5 million investment so that some people interpreted it as a rescue package. However Dragon Data insist. Although the fall off in demand emphasised for all the traditional nature of the industry, the outstanding aspect was that Dragon told on

to its 20000 market share. The company also thought that a request for capital was natural at that stage of its development, so the £2.5 million was an investment of boost allowing it to get up for the post-Christmas sales period.

At the time Dragon Data's shareholders also announced that former managing director Tony Clarke had previously indicated to the board that he wished to resign for personal reasons. Douglas Data's main shareholder is Proteon the high technology government division of President Edgar, once which is a shareholder in DEC. The board invited to DEC to provide one of its senior executives in Dragon Data a new managing director — and Benier took over on September 12.

### Optimistic view

He is optimistic that the £2.5 million was an investment based more than enough he confirmed and that the company's cash flow problems were very simple and overruled by the press. He thinks that Dragon Data is a very successful business and expects a turnover of £18 m in 1983 million for the company's first year of operation. As he points out this is very substantial growth — the company has come from nowhere to be a leading home computer manufacturer in less than a year.

He thinks the order book is full and he dispatch everything he build the company has already sold all the Dragon 54s it can produce for Christmas and Benier thinks the machine has been

very well received in the UK.

Before moving to Dragon Data Benier was deputy managing director of a DEC subsidiary specialising in microcomputer controlled testing and verification systems. He has a wide range of experience including engineering, financial management and business applications for computers. He explains that DEC is more of a collection of companies, much more decentralised than firms such as IBM so he is used to operating without a cushion. Dragon Data is much younger and the industry faster moving than his previous experience but, certain things are basic to every business. On the technical side he knows "enough to listen to what people tell me, and think that he has a balanced experience as a distinct advantage. As he explains, "You need to keep your eyes and objectives in mind and react fast, rather than keeping your head in the computer box."

Benier is fascinated by the speed with which the micro industry is moving. Talking just a weeks into his new job he says with a grin, "I feel as though I've been here for years, not just because things move so quickly but in terms of the amount I've covered. When I do not see how long he will be with Dragon Data officially he is an "improviser" secondhand from DEC, but expects to be there a minimum of six months and then he plans to leave in the foreseeable future. In that six months he will have acquired a great deal of experience — particularly if that sense of "time distortion" continues. ■

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Due to the successful sale of Cable Software programs, some of the programmers are threatening to take a three month holiday in the Bahamas to spend some of the money they have earned in the last few months. This means we may have some excellent far programs available to write 100% machine code programs. If you think you may be good enough for this type of programming, send us details of any games you have written — next year it may be your turn to get up in the Bahamas!

May I also thank you all for the support you give to our original appeal for more to help in the fight against the DROME and we, and even now, new recruits are still welcome to get on in this valiant project.



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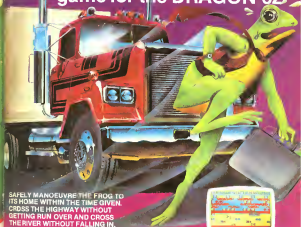
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of the hills

- 10. **Q:** What are the main types of...
- 11. **Q:** How do you calculate...
- 12. **Q:** What is the difference between...

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Elaine Smith, CMAA, PMP, is a senior project manager for the U.S. Army Corps of Engineers. She has 20 years of experience in project management and has been a member of the Project Management Institute (PMI) since 1995. She is currently a member of the Project Management Institute (PMI) and the U.S. Army Corps of Engineers. She is also a member of the U.S. Army Corps of Engineers. She is currently a member of the U.S. Army Corps of Engineers. She is currently a member of the U.S. Army Corps of Engineers.

Symbol	Abbreviation	Source of Data or Material	Controlled Terms
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# Set up your own chain reaction

**Pam D'Arcy** introduces *Charts*, a word game to test the numbers brain

being thoroughly disappointed with the apparent bugs in many Dragon-graphics programs featured in magazines. I have produced this second game for my family and fellow practical scientists. It is based on a card game I played just once in a club but which made a lasting impression on me. The game consisted of a pack of cards being turned in relayed motions and was a series of decisions— you added to the last set on card played if you could match in last letter(s) with the first letter(s) of one of your previous cards. Cards follow that also, except that a cross into the matching overlap to a maximum of three letters.

In order to minimize coding and debugging overhead I have deliberately chosen small numbers of possible error checks on the input/output instructions/regulator options through the screen (not all options always add to the program if necessary). There are some minor operational points that you can handle to increase speed. The

1. Содержание (содержит перечень вопросов, подлежащих рассмотрению на заседании Комитета, а также перечень документов, прилагаемых к докладу)

2. Вопросы (содержит перечень вопросов, подлежащих рассмотрению на заседании Комитета)

3. Доклад (содержит текст доклада, подготовленного Комитетом)

4. Результаты (содержит текст решения Комитета, принятого на заседании)

5. Приложения (содержит текст документов, прилагаемых к докладу)

Figure 1 Data entry sample. The words are ordered alphabetically.

REM statements can all be omitted (as I have deliberately omitted GOTOs). GOTOs is in parentheses for that reason.

There is a game for up to nine players (the computer can play too) with a choice of playing from a measure of 30 or new words each. The computer initially distributes all of the words (as instructed) to each player (selects at random from the available DATA). A further word is then selected at random as the starting word and is displayed on the screen, along with the first player's list of words.

Players in turn select from their lists numbered from left to right across the board. In choice one of them wants to the previous one played by matched to him.

case of two letters with the first one or two letters of a word is that if a player cannot go and currently holds a letter then the maximum (six or nine) number of words they composed adds a further word so that they play a full five-letter word turn. Also the player's 10 markers are prepared for a single draw in maximum when the computer is drawing for the last one or two words still available for allocation. If all players are able to draw a word and find that all allocations of words at their end are the same words left for allocation the game ends with a tie and the number of words still held by each player and the number of words each has played.

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```

30 REM CHAIN OF FARM D ARMY
32 REM JUNE 1983
30 REM INITIALISE PROGRAM
40 GOTO 100
50 REM INITIALISE NEW PLAYERS
60 GOSUB 200
70 REM INITIALISE PLAYERS
80 GOSUB 100
90 REM NEXT PLAYER A TURN
300 OF SPACELUT BAKR NF=1 BLUE NF=NF+1
110 REM PRINT PLAYER'S MOVES
120 GOSUB 100
130 IF FFA=OFF=OFF THEN FFA=1
140 REM EXTERNAL PLAYER
150 PRINT#44, WHICH WORD 43-71: INPUT ITEM
160 IF ITEM AND THEN TWO
170 IF ITEM THEN TWO
180 THIRDS=NF+1, ITEM: FFA=LEFT(THIRDS,1): FFA=LEFT(THIRDS,2)
190 IF THIRDS=" THEN GOTO
200 IF FFA<FPA AND FFA=FFA THEN GOTO
210 REM VALID
220 FPA=NF, ITEM=" "
230 GOSUB 100
240 REM CHAIN WORD
250 IF ITEM=4 THEN PRINT#44:44=ITEM+44:BLUE=BLUE+1 GOTO 300
260 IF ITEM=7 THEN PRINT#44:44=ITEM+44:BLACK=BLACK+1 GOTO 300
270 PRINT#44:44=ITEM+44:BLACK=BLACK
280 PRINT#44, FFA=FFA
290 GOSUB 100
300 PRINT#44, BLACK=1: PRINT#44, THIS=
310 BLUE=RIGHT(THIRDS,13): BLUE=RIGHT(THIRDS,2): FFA=LEFT(THIRDS,2)
320 IF OFF=OFF=OFF+1: IF OFF=OFF=OFF+1: LAST=
330 IF LAST=1 THEN GOTO

```



4 By pressing ENTER in response to the number of players prompt (the same can be achieved by entering 1 player too).

To get the computer to play enter MY TURN as the player's name it is designed to go back and watch the action after entering MY TURN for all over again!

The game is as good as its DATA. I haven't included any DATA statements in the program saving as I feel for entry purposes it is easier to offer you a list in English as it were. Then have words split over period lines (Figure 1 shows how easy it is to enter the DATA. I have deliberately placed the words in the lists in a jumbled order as a preparation for the 4 words selected to regularly occur for one player when using alphabetic sequence. The program can cope with words up to 10 characters long (three per column line).

I suggest that once you have typed in the program it can be saved as the "trivial" and appropriate DATA sets be added each program session being called something entirely recognizable.

## Inbuilt program flexibility

1 Amount of DATA. The program comes with a maximum of 100 words (i.e. 500/500 to increase this). Fewer than 100 words may be used by terminating the DATA with the string \*\*\*.

2 Number of players. The program automatically calculates the maximum per possible number of players (to a maximum of four) according to the amount of DATA and maximum number of words (six or five) each player is to be allocated.

3 Number of words per player. The variable NW as set up in line 500 determines this (six or five as required). It is an easy task to add this line prior to RUN should you need a different version from the one you have saved (perhaps from editing a different version too). Again I could have made this an INPUT parameter but would it increase your code entry task? ■

Words I agree more than a day designing using this set, so good luck to you if you can do better! Obviously the fewer questions you have on word starting endings, the best in the chances of a successful conclusion.

ADVENTURE	ACQUITTAGE	ANDRUS	ALIGN	ALIBURY
CHINA	CRIME	ENVELOPE	ERASE	NEAPOLITAN
THRAPAD	THEME	THEIA	TIARA	YULETIDE
BAST	NAIAD	NAPION	NEURONIC	PERSH
BRADICATE	EAST	PEMUR	PETCH	GENEROUS
RAFFLE	RESIN	RAG	STRAPE	SERIOUS
HUMOROUS	HALF	HERONIC	ICICLE	LIU
USHER	USUAL	URGE	URCHIN	LABOUR
CHILL	CHAMPARLOS	DECOUOUS	DEPRESS	DEL
STAG	SHOOT	THIMBLE	TETCHIE	TEA
GENTLEMAN	HYMNA	HYMHN	IOLE	DEA
EAGER	BAR	ERA	EARLY	EFFECT
PERFORMAL	RECIFE	READ	GLAZE	LIBRO
STEEL	STRING	STYLUS	GLORIE	FURROW
MAVE	INCH	LANDSD	LEGALISE	YACHTAGE
EMBOIS	EVEREST	EYE	SPREAD	DEGREE
LENGTH	NATURAL	YACHT	YETI	RAIUS
RECOUP	YEAST			

\*\*\* (50 words plus end marker)

Figure 1. An example DATA set using only ordinary words

Stationers. You've guessed it — the first set of DATA I produced! Compiled from 1994 1995/96 Passenger Timetable — but the difficulty is in arriving at a conclusion. Nevertheless it is a progressively increasing.

TEMPI	CHEPSTOW	EVESHAM	LEEDS	RYDE
AYR	EXETER	MARYLEBONE	HULL	ROBIN
LONDON	EXETER	YORK	YORK	SWANSEA
LIVERPOOL	GLAS	SCHELL	SIGUP	YARMOUTH
HARGROATE	YONOL	MATCHET	YSTRAD	EDITH
OLDHAM	BYFLEET	RYE	RODDY	WYBOLTH
AMBLESIDE	LESLAND	EWELL	FELUXTOWE	SOWHALL
DYNSCHURCH	VENTNOR	PONDANCE	PELAW	SPORN
CHARLHURY	MIRWCASTLE	ALFRINCHAM	RODRUTH	ARUNDEL
KETTERING	LIMBRICK	WORKSOP	GRIMSDY	SKENESS
MALLARD	UPHOLLAND	KNEZWORTH	LANDAFF	ESHAM
MALDEN	ENFIELD	AROLU	NETLEY	NEWARK
BAKESLOUNGE	THORPE	GLASSOP	GRAYS	DOLAN
TYNSLEY	ETRHUNA	WATERLOO	TONKESBORO	ILANGLU
GURDEE	RODSBORO	LYTHAM	ARMORHAM	ROCHDALE
ALDERSHOT	UPPERSTON	HOWE	KILMARNOCK	MAGHULL
LANCING	CLARK	SPENH	GRANDHARK	GALWAY
DERBY	THURGO	RENDAL	MARSHFESTER	THIRSK
SHREWSBURY	DEVONPORT	STOCK	TATTON	SALING
PWLLHILL	HAYES	ROSLARE	LEWES	CONBURGH

\*\*\* (100 stations but included for safety in case any are omitted during entry)

Figure 2. An example DATA set using the names of British Rail stations

```

340 PRINT#304, "CONGRATULATIONS, YOU HAVE WON - FRONT
350 REM ANOTHER GAME PREPARED.
360 PRINT#444, "WANT MORE? DUCT101, NAME PLAYERS, (THE DIFFERENT PLAYERS) (P1)
370 ITER=IMP+1:IMP=1:IMP=1: IF GIVE= THEN T=0
380 IF GIVE=0 THEN GIVE=END
390 IF GIVE=1 THEN GO
400 IF GAVE= P THEN THEN GO
410 GOTO 370
420 REM CHECK FOR UNENDING
430 FOR AA=1 TO NW
440 IF GAVE=P1 THEN IMP=AA, 1: IF GIVE= GIVE=P1, IMP=AA, 2 THEN GTO
450 NEXT AA
460 REM CAN'T GO
470 IF GIVE=0 OR GIVE=1 THEN GTO
480 REM GIVE PLAYERS A NEW WORD
490 GUESS=1:G=0
500 G=1: IF G=1 THEN G=1
510 FOR AA=1 TO NW
520 IF P=IMP, AA THEN THEN NEXT AA
530 P=IMP, AA+1:THIR
540 GAVE=0
550 GOTO 100
560 REM NO NEW WORD CAN BE A LOCKED
570 LAST=LAST+1: IF LAST=100 THEN T=0: ELSE T=0
580 REM BRACK RESPONSE

```

Continued on page 46



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```

390 DIM INVALID = 0
400 GOTO 440
410 GOSUB NO MORE AT 400: RETURN
420 GOTO 440
430 GOSUB YES YOU CAN GO
440 GOTO 440
450 GOSUB NO WAY
460 GOSUB 1430
470 PRINT#400, GOSUB
480 GOTO 170
490 FOR COMPUTER'S TURN
500 FOR GOSUB TO 0
510 IF GOSUB=LEFTS+PRINP,AA,1 THEN GOSUB
520 NEXT AA
530 FOR AA=1 TO 9
540 IF GOSUB=LEFTS+PRINP,AA,1 THEN GOSUB
550 NEXT AA
560 GOSUB 1430
570 PRINT#400, I CAN'T GO
580 FOR AA=1 TO 900: NEXT AA
590 GOTO 470
600 ITEM=AA
610 ITEM=PRINP,ITEM
620 FOR AA=1 TO 900: NEXT AA
630 GOTO 240
640 REM PROGRAM INITIALIZATION
650 CLEAR#400
660 DIM A$(1000), B$(1000), C$(1000)
670 REM SET UP DATA
680 FOR AA=1 TO 100
690 READ A$(AA): IF A$(AA)=
700 NEXT AA
710 B$(AA)=
720 AA=0
730 PLAYERS=1: GOTO 100
740 GOTO 40
750 REM INITIALIZATION FOR DIFFERENT GAME
760 CLR
770 PRINT#400, CHAIN
780 PRINT#400,
790 A$(1)=1: B$(1)=0: IF A$(1) THEN GOTO
1000: PRINT#400, NUMBER OF PLAYERS: (AA) : INPUT PTOT
1010 IF PTOT=0 THEN PTOT=1: PRINT#400, YOUR TURN: GOTO 1070: REM PATIENCE MOVE
ON
1020 IF PTOT=0 THEN 1000
1030 PRINT#400, NUMBER OF PLAYERS: (AA) : INPUT PTOT
1040 FOR AA=1 TO PTOT
1050 PRINT#400, : INPUT PRINP(AA)
1060 NEXT AA
1070 PRINT#400, PRINT#400, ANY KEY TO START
1080 ITEM=PRINP(AA): IF ITEM= THEN 1000
1090 RETURN
1100 REM INITIALIZE GAME FIELDS
1110 REM INITIALIZE WORD AVAILABILITY
1120 FOR AA=1 TO 900: NEXT AA
1130 CL=AA
1140 REM SET UP PLAYERS' WORDS
1150 FOR AA=1 TO PTOT
1160 FOR AB=1 TO 90
1170 ITEM=PRINP(AA)
1180 IF AB=ITEM=1 THEN 1070
1190 PRINP,PRINP=ITEM: AB=ITEM: NEXT AB
1200 GOTO 1070: CL=AA: NEXT AA
1210 NEXT AA
1220 CLR: PRINT#400, WORD TO THE LEFT ONE OR TWO LETTERS OF THE PREVIOUS WORD
-
1230 GOSUB 1070
1240 PRINT#400, PRINP
1250 PRINP=PRINP+1: GOSUB=PRINP,PRINP,1: GOSUB=PRINP,PRINP,2
1260 REM: LAST
1270 RETURN
1280 REM PRINT PLAYER'S WORDS
1290 REM CLEAR LOWER PART OF SCREEN

```

Continued on page 48



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## TOOLKIT FOR DRAGON 32

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1000 GOTO 1100
1110 PRINT@2000,MR(ROW*10)
1120 FOR AA=1 TO 3
1130 PRINT@1040+((AA+1)*11),PR(PP,AA)
1140 PRINT@1240+((AA+1)*11),PR(PP,AA+1)
1150 PRINT@1030+((AA+1)*11),PR(PP,AA+1)
1160 NEXT AA
1170 RETURN
1180 REM CLEAR LOWER PART OF SCREEN
1190 PRINT@1010 PRINT:PRINT:PRINT:PRINT
1200 GOTO 1400
1210 RETURN
1220 REM CLEAR BOTTOM LINE
1230 FOR AA=0 TO 31
1240 PRINT@1000+AA,DMO
1250 NEXT AA
1260 RETURN
1270 REM MOVE WORDS ALONG
1280 FOR AB=1000 TO 1270
1290 FOR AC=AB,PRK(AB+LEN)
1300 NEXT AC
1310 RETURN
1320 REM ALLOCATE NEW WORD
1330 ITEM=ND(INX)
1340 IF M(ITEM)=1 THEN 1500
1350 THRO=WR(ITEM):M(ITEM)=1:EL=EL+1
1360 RETURN
1370 REM UNFOLDABLE GAME
1380 CLS
1390 PRINT@40,"END OF THE CHAMP"
1400 PRINT@50,"WORDS LEFT PLAYED"
1410 FOR AA=1 TO 101
1420 PRINT PWR(AB),:PRINT@1040+((AB+1)*11),PWL(AA)::PRINT@1030+((AB+1)*11),PRNT(AB)
1430 NEXT AA
1440 GOTO 1460

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2. The first 10 teams to win the game will win £5,000 SLAM to use as a cost £10,000.
3. The first 10 teams to win the game will win £5,000 SLAM to use as a cost £10,000.
4. The first 10 teams to win the game will win £5,000 SLAM to use as a cost £10,000.
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# Beginner's guide to cracking machine code

*Bruce Devlin provides an introduction to BASIC machine-code programming*

HOW MANY TIMES has that Basic program you've written seemed far too slowly to give you any excitement? How often have you heard of the speed and excitement of programs written in machine code? How many times have you wondered where to start learning this mystical language? Well look no further — this article is designed to make the reader beginner through the first stages in machine code programming.

The first thing to realise about machine code is that we are communicating directly with the microprocessor. But it of the computer rather than through an interpreter as in Basic. This explains why machine code is so much faster. Imagine trying to communicate with a Japanese person via an interpreter. It would be much quicker if we were able to talk to him in Japanese. Another important thing to realise is that machine code is byte-oriented. This means that when the computer fetches instructions or data it does so one byte at a time. If we consider a single byte of memory, it may be used for many different things, for example:

1. It may represent a machine code instruction (but the microprocessor would need and execute whole instructions)
2. It may represent an unorganised random number 8 and 255.
3. It may represent a signed number between -128 and 127.
4. It may represent a character by containing an ASCII code.
5. It may represent eight binary on/off switches.

If the right electrical connections are made to the main processor by the main facilities then the following are also possible:

6. It may cause a character to appear on a video screen.
7. It may cause a pixel pattern (colour or black and white) to appear on a video screen.
8. It may be a part to some external equipment.

There are just a few of the uses a byte may be put to. It is the wheel of the program state.

To demonstrate the difference in speed between machine code and Basic before it is a short program which has been written identically in both the languages. (To load the machine code use the machine code loader with this article.)

By decoding the timer result in the Basic program by that in the machine code program you will see how many times faster machine code is for simple calculations.

Not all Basic systems can be performed faster in machine code however. The PRIME computer for example requires very little programme time but quite a lot of calculation time.

Enough of the introductory blarney — you are now probably ready to write some code yourself. Firstly speaking machine code is a series of numbers in memory which the computer understands. Trying to remember which number does which instruction is nearly impossible so a language called assembly language is

used to convert phrases we humans can recognise (mnemonics) into numbers that the computer recognises (op codes). The program which runs assembly language is known as an assembler.

Assembly language consists of a number of lines. Each line can have up to four parts: Label — Instruction — Data — Comment. For example in LOOP — SUBA — #7 — Subtract 7 from A, accumulator.

Labels are used to indicate to the assembler that whenever the word in LOOP appears then this is the list of programs we are talking about. In Basic we can use the phrase GOTO (number in machine code we use JP label (JP means Jump)). Therefore the label can be thought of as a type of line number. The difference is that only the lines that need labels are given them, all others are left blank. In reality the label is equivalent to the memory address where the instruction is stored.

Instruction is the part which is converted into a number and put into memory telling the computer what to do. In the case SUBA tells the computer to SUBTRACT something from accumulator A.

Data is the part which is converted into a number and put into memory telling the computer what information the instruction is to use. This could take the form of a number or address, a register name, an ASCII character etc. In the case #7 means the number 7.

Comments is ignored by the assembler and is only there to make the source for the programmer to follow the program.

10 TIMER = 0	10 #0SUB 1000:TIMER=0
20 #0SUB 100	20 ENED #H000
30 PRINT TIMER : END	30 PRINT TIMER : END
100 I=50:1000	100COPYRIGHT COMPUSOFT LTD 1983 BASH 1-2
110 I=0-1	4000 1001 ALL
120 IF I<0 THEN 110	4000 0C1000 1010 LDB #H1000
130 RETURN	4003 030001 1020 BLOPP SUBD #1
	4006 26FB 1030 BNE BLOPP
	400B 39 1040 RTS
	400F 1050 END

The short program in Basic at left and its machine-code at right shows the difference in speed between the two.



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# Machine code loader

THE FOLLOWING SHORT program is a useful machine-code loader. The best way to use it is by first saving it on cassette, then loading it before you type in one of the example programs.

The program displays the memory location currently being altered along with the previous byte and the following byte. Using the up and down arrow keys enables you to scroll through memory. (The ENTER key has the same effect as the down arrow key.) To enter a new code put it on the top and you will see it appearing at the right-hand side of the number as it shifts left. To end from the loader press the CLEAR key. You will be returned to your program.

```
1000 REMARKS ***** 0-9999 L-CODES *****
1001 CLEAR :PO,0:PO,0
1010 CLS :PRINT "START LOAD PROGRAM"
1020 PRINT "1-UP" :GOTO 1030
1030 PRINT "2-DN" :GOTO 1030
1040 FOR C=LOC-2 TO LOC+2
1050 PRINT USING "***** 5 5 = " "*****";HEX$(LOC+C);HEX$(PREV(C));
1060 NEXT C
1070 PRINT "END";HEX$(PREV(LOC));" "
1080 IF A=10000000 THEN LOC=LOC-1:GOTO 1030
1090 IF A=0 THEN LOC=LOC+1:GOTO 1030
1100 IF A=0 THEN LOC=LOC+1:GOTO 1030
1110 IF A=0 THEN LOC=LOC+1:GOTO 1030
1120 IF A=0 THEN LOC=LOC+1:GOTO 1030
1130 IF A=0 THEN LOC=LOC+1:GOTO 1030
1140 IF A=0 THEN LOC=LOC+1:GOTO 1030
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1950 IF A=0 THEN LOC=LOC+1:GOTO 1030
1960 IF A=0 THEN LOC=LOC+1:GOTO 1030
1970 IF A=0 THEN LOC=LOC+1:GOTO 1030
1980 IF A=0 THEN LOC=LOC+1:GOTO 1030
1990 IF A=0 THEN LOC=LOC+1:GOTO 1030
2000 IF A=0 THEN LOC=LOC+1:GOTO 1030
```

A typical line that would be entered by the loader is:

1000 10000000 0000 0000 0000 0000 0000 0000

- 1—Address: This is entered at the INPUT statement when the program is running. When it is entered, keep a check on the address to make sure it is the same as that given in the listing.
- 2—HEX data: Each byte consists of two characters and each should be entered (several one of them is given). To enter it like 1000 in this example type:
 

```
10 ENTER
10 ENTER
10 ENTER
```
- 3—Line number: A check of this particular assembler, please ignore.
- 4—Assembly language: This is the instruction written in assembly language.
- 5—Comment: These have been added to help you follow the program.

4 The microprocessor (from inside the Design 32) is a 68000 manufactured by Motorola and is one of the most powerful 16-bit microprocessors on the market.

The 68000 is capable of 8 bit operations (acting on one byte) it is 16-bit and some 32-bit operations (acting on two bytes or a half-word).

## Operations in registers

These operations are performed mainly in the registers. These are internal variables in which arithmetic and logic is performed. The registers are:

A—This is known as the A accumulator. To sample arithmetic and logic can be performed on an 8-bit number in the accumulator.

D—This is also an accumulator and is identical to A in operation.

X—This is a 16-bit accumulator having A as the first byte and D as the second byte. For example, if A contains 1000 and D contains 1000 then X = 10001000.

S—This is the stack pointer.

PC—This is the program counter (perhaps the most important register because it tells the computer where the next instruction is in memory. It is updated with every instruction executed).

CC—This is the condition code register. It contains a number of flags which are

updated (if necessary) instantly after every instruction is executed. They are used to indicate what happened after the last instruction (zero, overflow, negative answer, etc.).

DP—This is the direct page register which will not concern us at present.

R—This is an index register and is used for indexed addressing. This means that R contains a number which will be used as an address. For example, if R contains 1000 and the instruction LDA R is encountered then the A accumulator will be loaded from location 1000.

T—This is an index register and is identical to R in operation.

U—This is the user stack. It is identical to S but is not used by the system.

Now that you know what registers you have, the next thing to learn is what you can do with them. Here are a few instructions like moving numbers: LD ST CLR. These are mnemonic (abbreviated) phrases for the following commands:

LD = Load—This will load a number into a register. For example, LDA #7 is a register to the 7th statement.

ST = Store—This will store the contents of a register in memory. This is similar to the basic statement PC=address, A.

CLR = Clear—This will load a register with zero quickly.

The next thing to realize about machine code is that the variables where you remember things such as the position of a spacebar in a video game or the name of the person using the program are no longer names but memory locations, and the variables that you use for calculating are the registers. For example, if you stored the number of points a player has in location 10000 and you wanted to add three to it then you could do it like this:

```
1 LDA 10000
2 ADDA #3
3 STA 10000
```

Note that in assembler the X is represented by a 3 and not by an R.

Line 1—Load accumulator A from location 10000. Note that no 8-bit sign is present if the instruction were LDA #10000 then the microprocessor would try and load A with the decimal number 10000 and not load A from memory location 10000.

Line 2—ADD the 8-bit number 3 to the A accumulator.

Line 3—Store the A accumulator back in location 10000.

## Addressing modes

The way that a given instruction is known as the addressing mode. This can be a number, it is known as immediate addressing. It means use the number in the code where an address (or label) follows the instruction is known as extended addressing. It means use the number in this memory location. The following are examples of extended addressing:

```
LDD 10000 — Load accumulator from decimal memory location 10000
```

CLR = TOP—Clear memory location referred to by the label 10000.

STX 10000 — Store memory register X at location 10000. (X is a 16-bit register, the first byte is stored at 10000 and the second in 10001).

As mentioned before, another type of addressing is indexed addressing. Here instead of specifying an address, you give the name of a register. Imagine the X register contains the address of a square on the last screen (10000 for example) is that way seen on the right-hand side, and the A accumulator contains the number 200 (ASCII code for a space). Storing accumulator (A) at the location specified by X will cause a space to appear half way across the screen on the right-hand side.

```
2000 00 00 00X #200 — Load X with space address
```

2000 00 00 00X #200 — Load B with code for space blob

2000 00 00 00X #200 — Store blob on screen

2000 00 00 00X #200 — Return to line 2

## Auto-increment

Another version of indexed addressing is known as Auto-increment (eg STX X+). This is the same as before except that after D has been loaded the microprocessor performs X = X + 1 so in the above example, if STX X+ were used then when RTS was reached the X register would contain the value 10001 (10000 + 1). Before ending on work 1.







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ORIC 48K, Dragon 32, Tandy Color Computer

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4 DEC0 — B ← B — 1

DEC 30100 — Load contents of 30100 — contents of 30100 ← 1

MUL — Multiply A and B accumulators and store the result in C

LDZ #1234 — Load A ← 30102 and let B ← 4004

MUL — Let C ← 30102 × 4004 ← 40040

When using these functions the results will be 100 percent predictable if all the numbers (including the results) are in the range 0 — 255 (that is, this FF and binary 1111 1111) but what happens if we load

LDA #6, A ← 6

SUB #7, A ← A — 7 = 7

Let's try the subtraction

```

  6 ← 0000 0110
  7 ← 0000 0111
  -----
  1 ← 1111 1111

```

(Work through the last carried-in borrowing step to perform 0 — 1 giving 10 — 1 giving 10 — 1 which is decimal = 2 — 1)

## Endless ones

You will see the answer is an endless string of ones. As we have only 8 bits to play with the number — 1 is represented by hex FF. Let's just make better of the value. The sum 1 + (— 1) = 0

```

  1 ← 0000 0001
  -1 ← 1111 1111
  -----
  1 ← 0000 0000

```

It was general to be the computer and only look at the right hand eight bits then realise that this works — the answer is zero. This is known as the two's complement method of storing negative numbers. The method for calculating a negative number is as follows:

Let's take the example 42 (hex 2A). First write out the number in binary 0010 1010. Now invert all the bits 1101 0101 and finally add one 1101 0110 = — 42 = 3050. You will notice that for negative numbers the left-hand bits are always ones. I will leave it to you to show that — 128 has the same binary representation as — 128. This gives us the numbers +127 down to — 128 if we so choose. The instruction NEG (Negate) will turn a positive number into a negative one-verse. For example

LDA 30051 — Load A from memory location decimal 30051

NEG A — Negate A

STA 30052 — Store A in location 30052

## Negation

As with INC and DEC if we want to negate the contents of memory location 30100 we merely enter NEG 30100 and do assembly.

When arithmetic is performed (whether you choose numbers to be in the range 0 — 255 or — 128 to + 127) a register called the condition code register is updated. This register stores information so that decisions can be made by using the branch instruction.

Consider the BASIC statement  
20 IF 0 = 4 THEN GOTO 50

To convert this to a similar machine code statement we use the CMP (Compare) instruction. This instruction works exactly the same as the SUB (Subtract)

Basic	Machine Code	condition
carry clear	000	last carry clear
carry set	001	last carry set
equal zero	010	last number
greater or equal	000	last result >= 0
greater than	001	1 at result > 0
higher than	011	last result > 0
higher or zero	010	1 at result >= 0
less than or zero	100	last result <= 0
less than	101	1 at result <= 0
less	110	last result < 0
less than or more	111	1 at result < 0
not equal to zero	010	last number negative
plus	011	last number not zero
always	010	last number negative
never	011	always
no overflow	010	always
overflow	011	overflow flag clear

Branch conditions: 00, indicating a jump to — 128 to + 127 number

```

00 0000 0000 0000 0000 0000 0000 0000
01 00000000 0000 0000 0000 0000 0000 0000
02 0000 0000 0000 0000 0000 0000 0000
03 0000 0000 0000 0000 0000 0000 0000
04 0000 0000 0000 0000 0000 0000 0000
05 0000 0000 0000 0000 0000 0000 0000
06 0000 0000 0000 0000 0000 0000 0000
07 0000 0000 0000 0000 0000 0000 0000
08 0000 0000 0000 0000 0000 0000 0000
09 0000 0000 0000 0000 0000 0000 0000
0A 0000 0000 0000 0000 0000 0000 0000
0B 0000 0000 0000 0000 0000 0000 0000
0C 0000 0000 0000 0000 0000 0000 0000
0D 0000 0000 0000 0000 0000 0000 0000
0E 0000 0000 0000 0000 0000 0000 0000
0F 0000 0000 0000 0000 0000 0000 0000
10 0000 0000 0000 0000 0000 0000 0000
11 0000 0000 0000 0000 0000 0000 0000
12 0000 0000 0000 0000 0000 0000 0000
13 0000 0000 0000 0000 0000 0000 0000
14 0000 0000 0000 0000 0000 0000 0000
15 0000 0000 0000 0000 0000 0000 0000
16 0000 0000 0000 0000 0000 0000 0000
17 0000 0000 0000 0000 0000 0000 0000
18 0000 0000 0000 0000 0000 0000 0000
19 0000 0000 0000 0000 0000 0000 0000
1A 0000 0000 0000 0000 0000 0000 0000
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A0 0000 0000 0000 0000 0000 0000 0000
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F0 0000 0000 0000 0000 0000 0000 0000
F1 0000 0000 0000 0000 0000 0000 0000
F2 0000 0000 0000 0000 0000 0000 0000
F3 0000 0000 0000 0000 0000 0000 0000
F4 0000 0000 0000 0000 0000 0000 0000
F5 0000 0000 0000 0000 0000 0000 0000
F6 0000 0000 0000 0000 0000 0000 0000
F7 0000 0000 0000 0000 0000 0000 0000
F8 0000 0000 0000 0000 0000 0000 0000
F9 0000 0000 0000 0000 0000 0000 0000
FA 0000 0000 0000 0000 0000 0000 0000
FB 0000 0000 0000 0000 0000 0000 0000
FC 0000 0000 0000 0000 0000 0000 0000
FD 0000 0000 0000 0000 0000 0000 0000
FE 0000 0000 0000 0000 0000 0000 0000
FF 0000 0000 0000 0000 0000 0000 0000

```

Program 2: A simple test program to try ON your own

tion, except that the final result is not stored, and only the condition code register is affected. Therefore in machine code we get

1. CMP0 #4 — Perform 0 — 4 — 4 and remember result but do not store it

2. BNC @LINE60 — If the result of the previous statement was zero, then go to the line with the label @LINE60 otherwise continue with the next instruction

The table shows several branch statements along with the conditions about the test instructions that cause them to be true (that is, branch). The branch statement is similar to the Basic GOTO command. The



# The Dragon and Seikosha—a print partnership

James Greenall goes into print on the Dragon 32 and the Seikosha GP-100A

THIS ARTICLE examines the high resolution graphics output from a Dragon 32 to a Seikosha GP100A, a topic touched upon in Keith Brian's article in the May edition of *Dragon User*. It also shows the Dragon user how to use the dump program in conjunction with programs creating designs on the graphics screen.

## The hi-res screen

The Dragon 32 graphics screen is made up of 192 by 256 pixels or dots in the highest resolution mode. Each of these pixels represents one bit in the part of the computer's memory that holds the information displayed on the screen. Each byte is, of course, made up of eight bits. Therefore, each row of dots across the screen takes 32 bytes of memory (256/8), and the whole screen takes 6144 bytes (192 × 32). A pixel is printed on the screen if the bit is set to one.

## The printer

Unfortunately for the user, the graphics mode on the GP100A printer does not correspond to the same type of "bit mapping" as the screen. Whereas on the screen each byte represents a short horizontal row, on the printer the bit is vertical. Each character printed in graphics mode represents seven bits printed vertically and the eighth bit (the bottom pixel of each byte) is always set to one. The bit count from 0 to 128 from top to bottom. The printer prints graphics from the instruction `PRINTG:G (X)R(X)` where X is 128 plus the value of the bit to be printed. For example, one dot printed in the top left hand corner of the page would be printed by the command `PRINTG:G (129)R(129)`.

## Compiling print characters

The first print character is therefore made up of the total number of each of the first seven lines of screen. To detect whether the goal is set or not we can use the `PRINT` command which returns the value of the relevant bit from the display file. The value of these bits then needs to be multiplied by the relevant power of two to compute the CHRS value of the graphics character to be printed. This is done by line 1000 of Program 1. It represents the vertical axis and if the horizontal axis of



the screen display `PRINT` detects whether the bit is 0 or 1 and multiplies the result by the relevant power of two working down the screen. 128 (the last value) is then added to the total.

The FOR...NEXT loops on X and Y repeat the calculation for the whole screen working seven rows at a time (since STEP 7) across and then down.

## Using the program

Type in Program 1 and then `SAVE` it. To verify the program, reset the tape and attempt to `LOAD` it before entering `MODE` or switching off the computer. If the program has not saved satisfactorily the error report will be displayed but your program will still be in memory. If the program has saved properly you will get the usual OK prompt.

Now type in Program 2. This is just a single graphics program which draws a series of straight lines on the screen crossing each other to form a curve. `RUN` the program and press `BREAK` to return to Basic. It is a feature of the Dragon that the high resolution screen is entered and the computer is switched off on the command `PCLS` is used. Thus the loading of a new program or entering `MODE` does not affect the picture which has been drawn. You

may therefore load Program 1 and `RUN` it. A copy of the screen will be produced by your printer.

What a faithful reproduction of your screen: the hard copy produced does not use the printer to its best advantage as the result uses only 81 columns (far more than had the printer's width). To maximize the effect of the printed output, therefore, it would be more effective if we could double the width of the printed picture and print it on its side.

This is the effect of Program 3. It moves from the top right corner of the screen down computing each bit twice and printing each graphics character twice, thus producing a print that is four times the area of that produced by Program 1.

## Hard copy made easy

The ability of the Dragon to retain its screen as mentioned above makes the production of hard copy screen dumps very easy. All that is required is that, having run the program to set up the screen, you load and run the dump program. This can be applied to any graphics program in which it is possible to `LOAD` another program without switching off the computer. ■



## PROGRAM 1

```

10 PRGDE 4.1:SCREEN 1.8:REM SELECT HIGH RES GRAPHICS MODE
20 PRINT#2:CHECK(0):REM GET PRINTER TO GRAPHICS MODE
30 FOR X=0 TO 190 STEP 7:REM WORK DOWN THE SCREEN 7 LINES AT A TIME
40 FOR Y=0 TO 250:REM WORK ACROSS THE SCREEN FROM LEFT TO RIGHT
50 APPROXINTX=X+PPROINTX*Y,X+1:XX2=PPROINTX*Y,X+2:XX4=PPROINTX*Y,X+3:XX8=PPROINTX*Y,X+4:XX16=PPROINTX*Y,X+5:XX32=PPROINTX*Y,X+6:XX64=PPROINTX*Y,X+7:XX128=PPROINTX*Y,X+8:REM CALCULATE PRINT CHARACTER
60 PRINT#2:CHECK(X):REM SEND CHARACTER TO PRINTER
70 NEXT Y:REM START NEXT CHARACTER
80 PRINT#2:CHECK(10):REM TELL PRINTER TO START A NEW LINE
90 NEXT X:REM START NEXT PRINT LINE
100 PRINT#2:CHECK(10):REM RETURN PRINTER TO CHARACTER MODE

```

Program 1 (above) sets up the 16 cm print window. To verify it, connect the tape and attempt to CL (LOAD) a program entering PRINT in switching off the computer.

## PROGRAM 2

```

10 PRGDE 4.1:SCREEN 1.8:PCLS
20 FOR#=0 TO 910 STEP 5
30 LINE#X+4,0)-(250,X):PSET
40 LINE#X+4,191)-(250,191-X):PSET
50 NEXT
60 FOR#=191 TO 910 STEP 5
70 LINE(0,191-X)-(X,0):PSET
80 LINE(0,X)-(X,191):PSET
90 NEXT
100 GOTO 100

```

Program 2 (below) is a simple graphics program which draws a series of straight lines on the screen crossing each other to form a curve.

Program 3 (below) studies the use of the printer/paper and prints it on its side thus using the printer to its maximum width.

## PROGRAM 3

```

10 PRGDE 4.1:SCREEN 1.8:REM GET HIGH RES. GRAPHICS MODE
20 PRINT#2:CHECK(0):REM GET PRINTER TO GRAPHICS MODE
30 FOR X=0 TO 8 STEP 7:REM WORK ACROSS SCREEN FROM RIGHT TO LEFT 7 LINES AT A TIME
40 FOR Y=0 TO 191:REM WORK DOWN THE SCREEN CALCULATING FIRST HALF OF 7 LINE BLOCK
50 APPROXINTX=X+PPROINTX*Y,X+1:XX2=PPROINTX*Y,X+2:XX4=PPROINTX*Y,X+3:XX8=PPROINTX*Y,X+4:XX16=PPROINTX*Y,X+5:XX32=PPROINTX*Y,X+6:XX64=PPROINTX*Y,X+7:XX128=PPROINTX*Y,X+8:REM CALCULATE PRINT CHARACTER USING EACH P
60 PRINT#2:CHECK(X):CHECK(1):REM SEND CHARACTER TO PRINTER TWICE
70 NEXT Y:REM START NEXT CHARACTER
80 PRINT#2:CHECK(10):REM TELL PRINTER TO START A NEW LINE
90 FOR Y=0 TO 191:REM WORK DOWN SCREEN CALCULATING SECOND HALF OF 7 LINE BLOCK
100 IF X=0 THEN APPROXINTX=X+PPROINTX*Y,X+1:XX2=PPROINTX*Y,X+2:XX4=PPROINTX*Y,X+3:XX8=PPROINTX*Y,X+4:XX16=PPROINTX*Y,X+5:XX32=PPROINTX*Y,X+6:XX64=PPROINTX*Y,X+7:XX128=PPROINTX*Y,X+8:REM CALCULATE PRINT CHARACTER
110 PRINT#2:CHECK(X):CHECK(1):REM SEND CHARACTER TO PRINTER TWICE
120 NEXT Y:REM START NEXT CHARACTER
130 PRINT#2:CHECK(10):REM TELL PRINTER TO START A NEW LINE
140 NEXT X:REM START NEXT BLOCK OF 7 LINES
150 PRINT#2:CHECK(10):REM RETURN PRINTER TO CHARACTER MODE

```



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**Happy birthday**

## World map

From *P. Williams in Cambridge*  
THIS PROGRAM produces a map of the world on the screen. It would be suitable for use in games of its kind at a computer center in school.

Abstracts of the 1998 Annual Meeting of the American Psychological Association, Washington, DC, August 1-5, 1998.

THIS IS A music and graphics demonstration that is ideal for birthday parties, especially if your Dragon was a birthday present.

Part of the program was adapted from W. Soder's "Drawing Systems" printed in Mass. Graphic Union.

A claim is drawn with the appropriate position of rotation, the resulting isomer

Happy Birthday to You played then, which is key to pressed: the candied appeal to go out. That is achieved by switching from the first four graphics pages (which have the cake with candles begin on three) to the last four, which have just candles on three.

[illegible]

40	MPUs/Usr. age
60-120	Draws color
140	PLAYs tune
160-200	Draws cards and flowers
240	Copies graphics
260	Checks keyboard
270	Switches to next graphics screen
280	Infuses loop (press MPUs/Usr. to end)

The program is quite straightforward and unless the Dragon's Drive facility Experimenting with the P MODE and SCHEM in the (S) will produce slightly different results.

[illegible]

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[illegible]

Received 14 November 2000; accepted 12 February 2001

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10= SELECTED WORKSHEET TITLE
20= C B
30 PRINT *****
40 PRINT "READY A.M., H.M., E.M."
50 PRINT *****
60 PRINT *****
70 PRINT *****
*****
*****
*****
80 PRINT PRINT THE APPROX. ICS TO REMAIN
90 PRINT *****
100 PRINT "HOW MANY IS YOUR NAME? INPUT NO
110 FOR ***** OF PROBLEMS
120 FOR *****
130 IF NAME=0 THEN GOTO START CO-ORDS
140 GOTO 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815
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2. Each letter is drawn on the screen and the letters are randomly placed at the 12 major locations. The student reads the dots from left to right in a 3x4 matrix. 3x4=12.

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Two games of lettering company, the student has to identify the spelling words generated on the screen with those displayed.

3. The student is presented with a word and is required to identify the letters in the word and the student has to identify the letters in the word and the student has to identify the letters in the word.

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## Wizard Software

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[illegible]

**How It Works:** Survey  
This PROGRAM TAKES 12 values, scaling them down if necessary. The values are then drawn as a 3-D bar graph.

```

10 REM *****
20 REM # 3-D BAR GRAPH #
30 REM # BY ~ #
40 REM # RICHARD ODDO #
50 REM *****
60 CLS:DIM R(12)
70 PRINT TAB(18); "3-D BAR GRAPH"
80 PRINT PRINTING THIS PROGRAM YOU CAN ENTER A TOTAL OF 12 VALUES WHICH WILL B
90 SCALED IF NECESSARY AND THEN DRAWN AS A "3-D" BAR GRAPH.
95 PRINT
100 PRINT "THE PROGRAM ALSO ENABLES YOU TO DUMP THE SCREEN TO THE SEIYOSH QP-120
110 A PRINTER"
120 PRINT
130 PRINT "ANY KEY TO CONTINUE".(DEC 41134) CLS

```



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**ACTUAL SCREEN PHOTOGRAPH**  
In the top right corner, you can see the 3D view of the aircraft. In the bottom left corner, you can see the 3D view of the terrain. In the center, you can see the cockpit view with various instruments.

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**DETISTIA**  
High-Low  
Labyrinth  
Maze  
Maze



```

130 REM INPUT VALUES
140 FOR X=0 TO 11
150 PRINT "VALUE" Y=1, INPUT S(X)
160 NEXT
170 REM RESCALE VALUES
180 S=X+0.25
190 FOR S1=0 TO 11 IF S(S1)>0.168 THEN 190 ELSE NEXT S1
200 FOR S2=0 TO 11 S(S2)=S(S2)*S-NEXT S2
210 REM GRAPH GRAPHICS
220 PROC 4 PLS SCREEN 1,1
230 FOR Y=10 TO 250 STEP 20
240 LINE(Y, 100)-(Y, 100+Y/200),PSET
250 DRAW"ESR10"
260 LINE-(Y+10, 175),PSET
270 LINE-(Y+10, 175+50*(Y/200)),PSET
280 DRAW"ESL10010"
290 LINE-(Y+10, 100),PSET
300 DRAW"HL1005"
310 NEXT
320 REM GRAPHIC TITLE
330 FOR X=100 TO 20 STEP -20
340 LINE(1,60)-(10,X),PSET
350 DRAW"ESL100100501005"
360 NEXT
370 FOR P=20 TO 200 STEP 20
380 PRINT P,175)
390 NEXT P
400 DRAW"ESL100100501005"
410 EXEC 41154 "PUSH KEY TO CONTINUE"
420 REM RESCREEN CURVES
430 CLS PRINT @ 230, "PRINTED COPY", INPUT "X=H/L/PM
440 IF LEFT$(A$,1)="H" THEN RUN
450 IF LEFT$(A$,1)="L" THEN RUN
460 CLS GOTO 430
470 CLS
480 PRINT @ 230, "TITLE", INPUT T$
490 PRINT @-2, CHR$(10)
500 D=6-(LEFT$(T$)-2)
510 PRINT @-2, TAB(D), T$
520 PROC 4, 1 SCREEN 1,0
530 PRINT @-2, CHR$(10)
540 FOR S=0 TO 250
550 P=PPDINTX(S, 50+50+PPDINTX(S, 50+50)+PPDINTX(S, 50+50)+PPD
HTN(S, 50+4+4+10+PPDINTX(S, 50+50)+PPDINTX(S, 50+50)+4+10
560 PRINT @-2, CHR$(10)
570 NEXT
580 S=S+7 IF S>199 THEN END
590 PRINT @-2, CHR$(10)
600 GOTO 540

```

## Types

Figure 4. Performance of Final System

**TURBO** is a game in which you have to drive a car through a lot of slow-moving traffic. You use the left and right arrow keys for movement and to accelerate you press the A key. There are instructions in the Controls

In lines 70 and 80 a machine code program is loaded. This is used when you crash. The machine code program clears the screen at every character from 128 to 255 and makes a sound going up in pitch.

[illegible][illegible]



# Classified

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## FOR THE DRAGON 32

### ACE HIGH

Machine gun warfare in the sky

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# Competition Corner

Answers to Competition Corner  
Dragon User 10/13 Little Wymondley  
Street, London WC2H 9LD

## The Prize

THIS MONTH'S prize is a Dragon 64 from Dragon Data. The 64 can use Basic, Pascal and Cobol. It has three operating modes — a 32 mode allowing operation as a Dragon 32, a 48K mode giving 48K Ram and 100K Basic interpreter and a 64K mode.



## Contest rules

YOUR ENTRY must arrive Dragon User by December 31. The winner and solution to the puzzle will be printed in the March issue. You may enter the competition only once. Entries will not be acknowledged and no correspondence will be entered into.

# Use your imagination and win a Dragon 64

THE DRAGON 64 is a new machine to the month of taking a new approach to our competition, introducing a new puzzle.

First you have to suggest the most interesting application for a Dragon 64 in 60 words or less — let your imagination run free (well, not too free) but try to make your answer match the quality and sheer beauty of the machine.

The second part of the puzzle involves solving the problem set at the end of this article. But first try your hand at some Dragon assisted computer games.

The arrival of December 20 will also mean that many a Christmas stocking will be bulging with a new micro-computer. As this time of year is also a time for party games, why not make your computer is some of these activities?

Of course there is a wide range of games available on cassette, but it is also possible to program a computer version of some of the more traditional games. Often only a dozen or so program lines are necessary and you can make the games as elaborate or as simple as you like. Whichever way, there might be something out of the depth of your own capacities that will no doubt enjoy some of the more familiar games. Try this short program.

```
10 DIM TOPIC(25)
20 FOR N = 1 TO 25 READ
   TOPIC(N):NEXT N
30 DATA A FLOWER A COUNTRY A
   SDYS NAME A DOMESTIC ANIM
   AL TV PERSONALITY A CAPT
   AL CITY :=
40 TO 60 (DATA lines as necessary)
50 CLG PRINT TO PLAY PRESS ANY
   KEY
60 JS = INKEYS IF JS = THEN 60
80 CLG A = RND(25) L = RND(25) +
   64
```

*Tell us the most interesting use you can think of for a Dragon 64 and solve the puzzle by Gordon Lee — and a 64 could be yours!*

```
100 PRINT @ 60 TOPIC(S); PRINT @
   477 NOW PRESS ANY KEY
110 JS = INKEYS IF JS = THEN 110
120 PRINT @ 271 CHG(J)
130 JS = INKEYS IF JS = THEN 130
140 GOTO 70
```

The DATA lines 30 to 60 should contain the 25 topics used in the game, though the numbers can be adjusted if you wish.

To play, the computer selects a topic — say "A FLOWER" — and then chooses at random a topic — for example "J". The player must then think of the name of a flower beginning with the letter "J" (Jasmine) and touch a key and the next topic will be displayed. Award a point to the player who is first to call out a correct answer.

Another old party game is easily suited to the computer. A Conversation. Each player thinks of a story along the lines of —

"A boy met a girl at \_\_\_\_\_ (place). He said to her \_\_\_\_\_ she replied \_\_\_\_\_ And the consequence was \_\_\_\_\_"

## October winner

The winner of October's competition and recipient of a modem and RS232C interface from Cotwood Computers, well CP Engineering in C T Corbin of Reading, 20 Light area of numbers filed into the grid.

```
1203 137 7645 295 1205 187 7643 280
1205 187 7643 280 1208 187 7643 280
1208 187 7643 280 1209 187 7643 280
1209 187 7643 280 1210 187 7643 280
1210 187 7643 280 1211 187 7643 280
```

The computer should be programmed to store the relevant parts of each player's story in a series of dimensioned arrays. So, for 40 players the arrays would be set up DIM B(1000) DIM C(1000) DIM D(1000) and so on. Each player would then enter his story in turn, prompted by cues — (PRINT @ 2) ENTER A WORD NAME.)

When this has been done, the computer selects each component part of the story at random from all those entered and prints out the result — putting in the linking words of the to make the complete story.

The beauty of the computer version of the game is that many different stories can be generated from the same sets of data by just reselecting at random. In theory at least there would be more than 48,000 different stories possible with just six players.

If you have any favourite party games, why not try out a computer version?

And now to the second part of our competition. Santa's Dilemma.

Twelve days before Christmas, and let us say the day is

Old Santa was busy with packing his sleigh

To be on the safe side, so nothing was missed

He'd taken the trouble to write out a list

```
DOLLS — 12095
SWEETS — 170561
CAMERAS — 108434
PUPPETS — 1311035
BRUMMETS — 14032594
SCYTHES — 7
```

But one missing number caused Santa to doubt

How many bicycles should he write down?







**ATARI** 32K  
**BBC** Model B  
**DRAGON**  
**32 OWNERS**



# LIFT OFF with **SPACE SHUTTLE**



ON LAUNCH PAD WITH 2.5" FLARE

IN FLIGHT

As your shuttle you can control the most complex piece of flying machinery and maybe you can beat the five old pilots you must pass your wings!

Space Shuttle is a full feature 3D simulation with a differentiable, 3D, high resolution graphics show you with data and gauges, all of the instruments you will need during your space and the shuttle mission. The window are really quite something.

Your mission in the simulation is to make it past the shuttle and the



**MICRODEAL**

4000, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000

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